Montana Outdoors

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One Dollar

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THE COVER: As Ken Walcheck points out in his article in this issue, the turkey is an elusive bird. Quite literally, the turkey can see the blink of an unfriendly human eye from a distance at which that eye can't see the bird at all. So don't be surprised if the turkey eludes your eye and table this spring—instead, be cheered by the fact that you still have Clark Bronson's cover painting to enjoy. The sea otter is the symbol of National Wildlife Week, March 15-21. Once wiped out along much of its Pacific Coast range, the sea otter has begun to make a comeback from California to Alaska. Man's increasing dependence on the oceans for food, minerals, energy and recreation and the need to protect and wisely manage this vast resource emphasize the week's theme, "We Care About Oceans."

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The Editor's Column

As Larry Eichhorn and Bob Watts point out in their article beginning on page 30, wildfires have long been considered the scourge of forests, rangeland and wildlife. But they also explain that, over the past several decades, scientists have discovered fire to be an important natural factor in the evolution of many North American plant and animal communities.

Through natural selection, many plant species have developed special adaptations to fire. The serotinous, or closed, cones of jack pine are a prime example. In this and in several other species, the cones are sealed with a resin that melts only at high temperature. When a fire passes, the cones open, dispersing the seeds to begin a new pine stand.

Fire can also benefit many wildlife species because it eventually increases the availability of food and cover. Mature forests make poor homes for many birds and mammals that depend on young stages of vegetative growth for browse, nesting habitat and protection from predators. Bobwhite quail, sharp-tailed grouse, prairie chickens and many other birds benefit from periodic fires. As the authors point out, the Kirtland's warbler was nearing extinction until researchers discovered that its nesting habitat (young jack pine groves) was disappearing due to fire exclusion in Michigan. The food supplies of large herbivores like deer, elk and moose can also be favorably affected by fires, because of the succulent vegetative growth that follows burning.

The theory that natural fires have little harmful impact on wildlife has been borne out by studies in several places. The picture often conjured up of frenzied wildlife fleeing before a wall of flame is largely mythical. In 1969, fires burned 86,000 acres of the Kenai National Moose Range in south central Alaska. Even in this wildlife-rich area, scientists from the U.S. Bureau of Sport Fisheries and Wildlife could find no dead or burned bear, moose or caribou. Observations like the following were common: "At one small lake (one-eighth of a mile wide), a swan family with two cygnets was sighted in the water and a moose was feeding near the shoreline while the spruce trees torched along the opposite shoreline and went up in flames." Although small mammals were undoubtedly killed, voles, shrews and birds were reinhabiting the area one year after the fire.

In the Boundary Waters Canoe Area of northeastern Minnesota, trap lines run three weeks after a 1971 fire showed that small mammals were active in even the most severely burned parts of the forest. Apparently these animals went underground and reappeared after the fire passed. And only two growing seasons after the fire, head-high aspen sprouts covered much of the area, providing excellent browse for deer and moose.

Perhaps even more important is the role that fire plays in maintaining the energy balance of entire forest ecosystems. In biological terms, fire is one means by which organic matter is converted to more stable forms of energy. By suppressing all wildfires, man merely postpones the inevitable release of energy stored through photosynthesis. In most parts of the country, the longer a forest goes unburned, the greater the build-up of fuel on the forest floor, and the more destructive the fire is likely to be when it finally occurs.

In the Bitterroot National Forest of western Montana, for example, U.S. Forest Service ecologist Steve Arno traced the fire history of several areas. He found that between 1735 and 1900, the average fire-free interval in selected stands ranged from six to 41 years. He also found a marked decrease in fire incidence after 1920—about the time when fire control activities were initiated. He concluded that "continued fire suppression without fuel management . . . probably favors the development of high-intensity fires."

All this is not to say that we can afford to be careless with campfires and matches; wildfire, in the wrong place and at the wrong time, can pose a serious threat to human life and property. It can be safely used as a tool only by foresters and wildlife managers trained in fire behavior and ecology. But it is important that we all understand the natural role and ecological significance of fire, so that we can learn to live with it naturally and sensibly.—*Dave Books*

Kirtland's warbler
(graphics: Donita Sexton)

HOW TO TALK TURKEY AND AVOID EATING CROW

by Ken Walcheck

SOFTENED by yesterday's rain, the forest floor doesn't betray the hunter's presence as he slowly moves up a shallow coulee. Fifteen minutes before, the forest had been dark and silent. Now, almost imperceptibly, the darkness fades and a gathering of light rays falls gently. The rays advance over thickets of ponderosa, slide across a maze of twisted coulees and salute the showy crocus and yellow fritillaries.

Now kneeling, with his back against a pine, the hunter fidgets, looking for a more comfortable position. He waits. He knows this particular site holds at least one tom turkey.

The stately gobbler roosts high on a secure pine limb several hundred yards away.

The hunter shivers as a great horned owl shatters the stillness with a resonant four-hoot salute. For some unexplained reason, the owl's call serves as an instinctive irritant and triggers a spine-tingling thunderous reply from the gobbler. Although the reply indicates the turkey is near, its exact location is hard to pinpoint.

The hunter quickly moves the wooden paddle across the chalked lip of his cedar box turkey call, starting first with some low, muffled yelps and following with a couple of sleepy clucks. Before the hunter sounds the last cluck, the gobbler announces his passion with a rumbling double gobble and quickly flies down to the forest floor with his wings making a loud "whup-whup-whup" sound.

Before the hunter can put his call down, he hears the sound of running feet. Forty yards down the ridge, he spots a bluish-red head that rises out of the forest canopy like a shadowy watercolor and then disappears behind a small knoll.

Quickly, the hunter shoulders his gun in anticipation of the gobbler stepping out in full view. What seems like an eternity passes. The hunter's heartbeat sounds in his ears and his eyes sift through the timber hoping for a patch of gobbler. Seconds become minutes, and still no gobbler. A small sapling crowned with tufts of pine needles looks vaguely like the neck and head of a turkey and gives the hunter a brief start, but the real thing has evidently disappeared. What seemed like a sure thing didn't happen.

* * * * *

When stalking the wild turkey in spring, no two experiences are alike, and there's no such thing as a "sure" bird. Pursuing a gobbler is challenging, frustrating, agonizing, thrilling, miserable, puzzling, rewarding, inconsistent, habit-forming and a number of other things that aren't supposed to go together, but do.

Most novice or intermediate turkey hunters will experience more close encounters than actual gobbler kills. Close calls are rewards of patience, effective calling, sound scouting and proper technique. Those who consistently bag gobblers in the spring are, for the most part, skillful veterans who enjoy both good luck and good shooting.

Many consider birds—especially turkeys—intelligent and crafty animals. Birds seem to be very clever in migrating over great stretches of trackless forest and sea. They appear foresighted when they build well-engineered nests in which to raise their young. They exhibit tender devotion when they incubate their eggs and brood, feed and defend their young, sometimes at the cost of their own lives.

Birds are remarkable for many achievements which man, with all his brain power, would find it hard to duplicate. Ages of natural selection

have provided birds, far more than man, with instincts highly adapted to solving routine problems and avoiding existing hazards. As for the turkey, it can quite literally see the blink of an unfriendly human eye from a distance at which that eye can't see the bird at all. If surprised, a 20-pound gobbler with a five-foot wingspread can flush like a grouse, sprint at a speed of 25 miles per hour on powerful legs and, when in flight, blaze through a maze of pines leaving in its wake pieces of tree falling out of the sky. In turkey woods, as in other casinos, the house has a comfortable edge.

Hunting the wild turkey has been an American sport since colonial days, and the very best of the sport is experienced when the hunter calls the turkey into shotgun range. It's one thing to snipe at a gobbler at long range with a scoped rifle; it's quite another to call him in close and then take him with a scattergun. Those who maintain that "shotguns are a handicap" under typical western conditions simply don't know much about spring turkey hunting.

Despite what some sportsmen think, the turkey is not native to Montana. When the Department of Fish, Wildlife and Parks decided to introduce turkeys into Montana, the Merriam's turkey was selected as the species most likely to survive. The Merriam's, native to the mountains of the Southwest, has been transplanted widely and successfully into western states where isolated ponderosa pine cover juts up from grass and sagebrush lowlands that had barred the birds' natural spread.

In 1954, department biologists introduced 13 Colorado birds into the Judith Mountains of central Montana. In 1955, 18 turkeys from Wyoming were released into the Long Pines area of southeastern Montana. Wyoming stock was also used in the Ashland area of southeastern Montana in 1956 and 1957 when 26 birds were released. This was the last time stock from outside Montana was transplanted.

Subsequent trapping and relocating spread turkeys to more than 30 sites in Montana, with the Long Pines and Roundup areas supplying most of the birds. Emigrations provided satellite populations and the Merriam's future in Montana now looks very promising.

Since the first three-day season in 1958, turkey hunting has provided quality recreation for hunters. Although fall with its either-sex season attracts more hunters and a larger harvest, spring hunting for the bearded tom gains in popularity each year. In spring 1979, 358 hunters harvested 56 toms with a success rate of 16%. Carter County in southeastern Montana provided the bulk of the spring turkey harvest. The fall season attracted 2,494 hunters who bagged 1,126 birds with a success rate of 45%.

The primary reason for the increased interest in turkey hunting probably lies in the challenge of the sport. Outwitting a gobbler on its home turf ranks as a supreme accomplishment in even the loftiest sporting circles. A further dimension of excitement and challenge is added when a call is used to lure a bearded tom in.

Over the years, I've read a fair number of turkey articles which strongly suggest that turkey calling is a mysterious, complex art best left to an elite and gifted few. Granted, one can read volumes about the various simulated calls made by veteran turkey hunters. There's the cluck, whine, purr, the kee-kee run, the gobble of the young tom and old tom, the hen and gobbler yelp, the supergobble and others too numerous to remember —let alone master.

Two general classes of turkey calls have evolved, each with a wide selection of calls. One category uses the inhalation or exhalation of breath by the caller and the other utilizes friction—wood scraped over chalked wood, or over slate or other material.

Because of all the material written about the challenge of stalking the wild turkey, many newcomers to the sport attribute supernatural characteristics to turkeys, attributes they just don't possess. To put it simply, some hunters are psyched by a wild gobbler. I firmly believe any beginner can call in a tom turkey if he makes up his mind he *can* do it. All it takes is desire, patience and a little practice.

Until you have called one turkey within effective shotgun range, you have no idea whether you can do it. But when you do it for the first time, it may seem so ridiculously easy that you will say, "Hey, what's so difficult about turkey calling?" Don't get carried away with your success. Your next attempt to call in a bird may wind up in complete failure, leaving you with crow to eat instead of turkey.

During a spring gobbler hunt, no two experiences are the same. Many seasons end with far more tales than turkeys. That is as it should be when you stalk what many consider the king of game birds. After many years of hunting turkeys in Montana, I've learned a few things—mostly the hard way—that might help you bag a gobbler this spring.

• Finding a place to hunt turkeys in the spring does not present major problems since most hunting in eastern Montana occurs on either U.S. Forest Service, U.S. Fish and Wildlife Service or Bureau of Land Management land. But *finding* turkeys can present a problem. I like to climb a high butte during late afternoon and scan the open park areas with a spotting scope. If any toms are in the vicinity, chances are good they will be out in the open going through their courtship display. Once you spot a tom, mark his location and arrive there early the next morning before he leaves the roost tree.

Some hunters use an owl hooter during the early morning to get roosted birds to call back. Hooters are commercial mouth-blown devices that imitate a large owl's hoot. Once a gobbler is located, the hunter can move in quietly, then hide and use his turkey call.

If you don't hear a bird gobble of its own volition, move through the woods and make several hen yelps every 300 or 400 yards. Such calling should be done only from a location where you can hide quickly and also have a good view of the surroundings.

One word of caution—always carry your gun to the site when you call. One opening day, I left my gun in the car and walked out to a point overlooking a large coulee. About 30 seconds after I yelped, there was "whup-whup" of wings and a big gobbler flew in and landed about 25 yards from me. Needless to say, that's one tom that made a turkey out of me.

• Be in the woods by the crack of dawn because this is when the breeding-age toms begin sounding off with lusty gobbles audible half a mile away

on a still morning. Breeding-age toms do most of their gobbling during the first two hours of daylight, but during the height of the mating season, an occasional gobble may be heard at any time of the day.

• Whether you wear camouflage or not, your clothing should blend with the foliage around you. Although some hunters swear by facial camouflage and clothing, I'm more inclined to believe one's movements spook turkeys.

• Where should you take a stand? After a gobbler sounds, try to move within 200 yards of his position and then choose a stand in a fairly open area. As a general rule, turkeys avoid thickets that could conceal an enemy. A turkey likes a certain amount of ground cover within the timber to make it feel secure. However, the ground cover must be open enough to instantly afford the turkey good vision, allow it to walk without touching or coming into bodily contact with thick ground growth and assure it quick wing action and passage if need be.

Turkeys are like any other animals —their behavior is mostly directed toward survival. Once you are on a stand, sit still and be patient. Smoking, coughing and other unnecessary movements simply do not fit into the strategic plan for hunting turkeys. If you hunt turkeys from a stand long enough, you will find gobblers tend to approach the backside of a hunter. I believe this occurs because a hunter normally sits with the sun to his back since it's difficult to look into the sun. A gobbler has the same idea. When he comes to your call, he maneuvers to get the sun behind him. As long as I have been hunting turkeys, I can never remember a tom approaching my stand with the sun in his eyes.

• Selecting a call presents a bewildering problem for the beginner, especially if he asks for advice—few turkey hunters are likely to agree on a selection. This diversity is understandable, since calls differ widely in appearance and method of operation.

One of the most popular and easiest to use is the large hinged-type box call. The top edges of the box are beveled and are chalked by the user. By drawing the paddle or lid very slowly and gently across either lip, the low, seductive mating yelp of a hen can be imitated. This is the only call really necessary for a successful hunt, and it's better to master one or two calls than to be mediocre with half a dozen.

The yelp is soft and plaintive and usually uttered in a series of threes. Visualize it as: "kee-yuk, kee-yuk, kee-yuk . . . kee-yuk, kee-yuk, kee-yuk." It must be done pleadingly, with medium-pitched sounds, and with each perk ending on a rising inflection. I start my calling sequence with a run of four or five yelps.

When the hen is responsive to the gobbler, her call is snappy and to the point. As soon as you make some hen yelps, the tom will usually respond quickly with a gobble. I like to make a second call soon after the first to convince him that he really heard what he thought he did. Then I remain quiet for a while, regardless of how much he keeps gobbling. You can be sure he has zeroed in on your position and can come straight to you, if so inclined. If he is still gobbling from the same location 10-15 minutes after you last called to him, you might try a couple of clucks every five or 10 minutes until he comes in.

But a word of warning about the "cluck": The beginner's "cluck" may fade into a "putt." The "putt" is the alarmed turkey's danger call. A false "putt" is enough to send a smart turkey over the hill, and all turkeys are smart when it comes to this call. There's one small consolation if you make a mistake: Nobody but the turkey will know you goofed. And if you do, you will have lots of time on your hands in which to fabricate a good tale.

If the bird is a 2-year old tom unable to gather a harem of hens, he will often move in quickly after hearing your hen yelps. But if you are working on a long-bearded old tom with a complement of hens in the vicinity, you are probably going to have a frustrating experience. The hens in his harem may go to him soon after he starts gobbling and your early morning efforts to lure him to you usually will be futile. A little patience and a different call may turn the tables. Under such a set of circumstances, a gobble from your box call may spell the margin of victory. Many box calls have a criss-cross arrangement of rubber bands holding the lid gently to the box top. If you

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photo: Jon Cates

hold the call bottom down in the palm of your hand, handle pointed away from you, a quick shake will produce a gobble. This call often moves a hesitant tom into range because he thinks a rival gobbler is moving in on his hens. Use it with caution, however, because it also might call up another hunter.

Probably the best way to learn the yelping sequence of the hen turkey is to listen to a good caller or to a turkey-calling instructional record. If you are halfway serious about learning the basic calls, practice the yelping sequence outdoors throughout the year and don't wait until the day before the hunt to review your calling instructions and to begin practicing yelps.

• Most turkey hunters recommend using a 12-gauge gun with a full choke and I agree. Turkeys are big, tough birds, and their vital organs are tucked away beneath heavy, metallic-colored feathers. Breeding-age toms also have what is called a breast sponge which acts like a flak jacket. It's a large mass of fatty tissue that helps them remain in prime physical condition during the breeding season. Wild turkeys also have blinding speed afoot, and even a broken wing seldom results in a turkey in the oven.

Those hunters—including myself—who have experienced cartwheeling a big tom at 30 or 40 yards only to have it get up again, find it incredible to believe that any bird, no matter how big, could take such a hit and yet sprint away. Because a turkey's body is nothing less than a miniature armored tank, aim all shots at the head and neck.

• Weather conditions play a big part in the success of the spring gobbler hunt. A day that starts with a clear, cool morning and no wind is a good choice for hunting turkeys. On such mornings, I have heard as many as six to eight gobblers sounding off from different sites in a prime patch of turkey country. Eastern Montana unfortunately has its share of inclement weather during the spring turkey season. Cold weather—especially when coupled with a foot of snow—usually dampens the amorous attitudes of gobblers, making calling almost useless. If such weather conditions occur, stay home, practice your calls, read up on the life history of the wild turkey and hope for a better day.

Persistence and perseverance usually pay off. Even if you are a top-notch turkey hunter, you can't be certain that last year's hotspot will produce the same quality of hunting this time around. On most spring hunts, I cover a pretty big chunk of country looking for turkey sign and listening for a gobbler to sound off.

This past spring, I worked up a couple of walnut-sized blisters the first day of the hunt while breaking in a new pair of boots. Late in the afternoon, I heard a tom sound off on the far side of a large coulee. As I started to walk down the steep-sided slope, my feet ached so badly that I almost talked myself into returning to the tent. I had to psyche myself up to continue the hunt by saying, "You know you get this chance only once every spring."

As I limped to the top of the coulee, I walked down a forested ridge and took a stand. I ran through a series of four yelps and got an immediate answer. I yelped back, and before I could put the call down, a tom raced over the hill. As he headed in my direction, his head swung back and forth in the bright light with his fleshy wattles displaying a kaleidoscope of color, from red to blue, purple and white. When he got about 25 yards from me, he pulled his head back, puffed out his chest and spread his ornate tail into an elegant fan. I bagged him before he had a chance to plant his upheld foot on the next pine cone. The amazing thing is that I never felt or thought about my blistered feet as I ran over to the downed bird.

One final comment about spring turkey hunting. If your first gobbler doesn't fit the pattern I have outlined, don't be surprised. The wild turkey is determined and seems to fool and frustrate the best of hunters. But there's a challenge that brings you back again and again. Indeed, the feeling is almost good enough to make you forget those gobblers that get away—almost. ■

Contributors

• What seems like a sure thing often isn't. A number of things that aren't supposed to go together—such as frustration, thrills, misery, challenges—do. About the only thing you can say for sure about a spring turkey hunt is that no two experiences are alike. Turn to page 2 for **Ken Walcheck**'s instructions on "How to Talk Turkey and Avoid Eating Crow." An avid turkey hunter himself, Walcheck readily admits he has more tales about turkeys than he has had turkeys on the table. He continues his duties as the department's information officer for the Miles City region. He holds a B.S. degree in wildlife conservation and biology from Wisconsin State University and an M.S. in applied science (ecology) from Montana State University, Bozeman.

• *Montana Outdoors* is very pleased to feature a cover painting of Merriam's turkeys by Bozeman artist **Clark Bronson.** He began his career as staff artist for the Utah Fish and Game Department and was soon recognized as one of the foremost painters of wildlife in America. He became interested in the challenges of three-dimensional work and his subjects began to come to life as sculptures. Critics and art collectors praise the minute detail and anatomical correctness of his sculptures—lessons learned well from his wildlife painting. He now creates only four or five new sculptures each year, ranging from birds of prey and game birds to big game animals and fish. His studio is at 17 Hitching Post Road in Bozeman.

• Although the killdeer is one of 40 species of shorebirds reported in Montana, it is frequently found in fields and pastures, often far from water. Its nest is little more than a scrape in the ground. But let an intruder approach too closely, and the killdeer will play the wounded-bird act. After a loud call of distress, it takes off in frantic alarm and then returns and issues the call again and again. **Vince Yannone** contributes another entertaining piece to our nongame series. The department's education assistant, Yannone is well-known for his lively and informative television shows about Montana's wildlife. Turn to "Shorebird Actor" on page 8.

• As **David F. Pac** and **Richard J. Mackie** write, "The mule deer . . . is a product of the land; its fortunes are inseparable from events that influence the quantity and quality of its habitat." One of Montana's pieces of "blue ribbon" mule deer habitat might be the Bridger Mountains near Bozeman. But like many of Montana's scenic mountain areas, the Bridgers have attracted more and more people, and subdivisions are now scattered across formerly undeveloped sections of the region. For an examination of this "Conflict for Space," turn to their article on page 13. Pac is a research biologist for the department. His mule deer studies in the Bridgers began when he was a graduate student at MSU in 1974. He holds B.S. and M.S. degrees in fish and wildlife management, both from MSU. Mackie is a professor of wildlife management at MSU and coordinator of the department's Statewide Deer Research Program. He is especially interested in mule deer and has been studying both populations and habitats in Montana since 1960, particularly in the Missouri River Breaks and Bridgers. He has a B.S. degree in fisheries and wildlife from Michigan State University, an M.S. in wildlife management from Washington State University and a Ph.D. in fish and wildlife management from MSU.

• Researchers have often found that coyote populations fluctuate (often quite widely) independent of control activities, apparently in response to changing abundance and availability of prey. Certainly, the question of whether coyotes should be controlled in an attempt to benefit game populations has been around for a long time. For some perspective, and answers to that and other questions about coyotes, turn to **Philip Schladweiler's** article, "Coyotes and Big Game," on page 17. Schladweiler is a research biologist with the department. He has B.S. and M.S. degrees in wildlife management, both from the University of Minnesota.

Illustrations for the coyote article are from **Ralph Krieg** of Helena. A newcomer to *MO*, Krieg recently retired as a bureau chief for the Montana Department of Revenue. In addition to hunting and fishing, he is looking forward to having more time to devote to his art.

• An evening spent with Boone and Crockett's Seventh Edition of "North American Big Game" is bound to lead to some surprises. For example, many record grizzly and black bears have been taken in the 1970s. For other "Nuggets Panned from Boone and Crockett," turn to **Norman C. Roettger Jr.**'s article on page 23. Roettger is a U.S. District Judge in Fort Lauderdale, Florida, and lists big game hunting as one of his hobbies. He has hunted big game in Montana every year since 1975 and we're pleased to share the results of his survey with our readers.

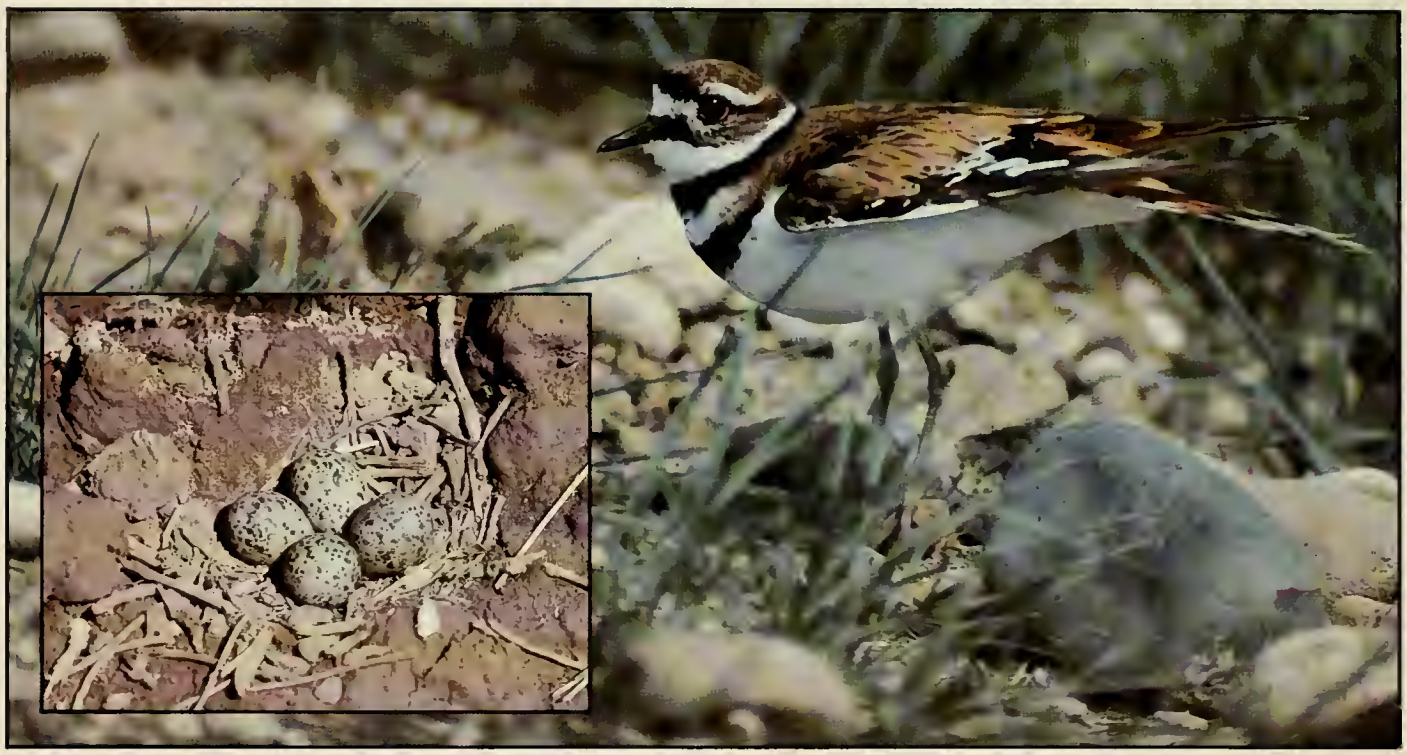
His article is illustrated by another newcomer to *MO*, **Robert Neaves** of Corvallis. Neaves is the art director for the U.S. Forest Service's Northern Region. His paintings hang in many private and business collections throughout the country and he did the cover for "The Grizzlies of Glacier." He is at work on his 12th one-man show, this one to run from March 14-April 15 at the Magic Mushroom Gallery in Missoula.

• The story of the creation of Lewis and Clark Caverns is a fascinating chapter in Montana's geological history. As **Richard B. Aram** writes, "Although the . . . acts of nature that created Lewis and Clark Caverns will not be repeated for thousands or millions of years, we can still experience some of their work." Millions of fossils, the tilted and broken rocks and the water sculptures are truly "A Showcase of Nature's Forces." Aram is a geologist with Phillips Petroleum Co. in Billings and he has a B.S. degree from Wheaton College and an M.S. from MSU, both in geology. The article is based on his master's thesis on the caverns. Turn to page 25 for his article.

• Like plagues, fires have often devastated otherwise peaceful environments. But, as **Larry C. Eichhorn** and **C. R. Watts** write, "More recently, . . . scientists have discovered the importance of fire not only for animals, but also for a variety of plant species." Land management agencies now recognize the value of fire as a tool for creating habitat for wildlife. To learn more about these positive aspects of fire, turn to "Wildfires: Not Always Disasters" on page 30. Eichhorn is a district wildlife biologist with the Bureau of Land Management in Lewistown. He received a B.S. degree in range and wildlife management from UM. Watts is a wildlife biologist with the department in Lewistown. He has a B.S. degree from UM, an M.S. from Pennsylvania State University and a Ph.D. from Utah State University.

• If cross-country skiing is your favorite winter pastime, you have watched your sport burgeon from a handful of dedicated long-board enthusiasts to an army. **Terry Knupp** examines the needs of cross-country skiers in the 1980s and asks, "Who Should Provide?" She also lists what should be provided and suggests ways in which the needs could be financed. A planner with the department's Parks Division, she earned a B.S. degree in recreation and park management from the University of Oregon. Her article begins on page 32.

• We would like to thank the following free-lance photographers and artists for their continued support. Their work appears throughout this issue, as it has in many past issues: Jon Cates, Missoula; Bill McRae, Fairfield; Jerry Manley, Butte; Alan Nelson, Great Falls; Jeff Oens and Dave Shors, both of Helena; Robert Spannring, Livingston, and Paul Updike, Billings. ■



The killdeer (photo: Alan Nelson) is one of 12 shorebird species known to breed in Montana. Females make their nests (insert photo: Jon Cales) in pastures, plowed fields and other cleared areas.

Shorebird Actor

by Vince Yannone

THE KILLDEER is one of 40 species of shorebirds reported in Montana. The bird resides in the state during spring, summer and early fall and then migrates south when cold weather blows in. Killdeer have been noted in Montana as late as a few weeks after the first frost. When warm weather returns to the Big Sky country again in spring, so do the killdeer.

A medium-sized shorebird, the killdeer measures about eight inches from head to tail. The bill is rather short with a noticeable swelling near the tip. The neck and tail are also short, with the tail carried horizontally, giving the bird a perky look. Wings are pointed, and the killdeer flies directly and fast. Distinctive coloration in the adult includes two black breast bands set off by white (the young have only one band). Another coloration characteristic is the beautiful orange tail and lower back.

Although the killdeer (*Charadrius vociferus*) is classified as a shorebird, it is very common in fields and pastures, often far from water. It is one of 12 shorebird species known to breed in Montana. Females make their nests—little more than scrapes in the ground—in pastures, plowed fields and other cleared areas. As a rule, the nests are also some distance from water. When the young hatch, the adult leads them to the nearest water, frequently as soon as the moisture has dried from their downy "feathers." The watering hole is many times only a surface pool, but the chicks dabble about the muddy edge and survey their new world. Their greyish-brown mottled coats and their habit of lying perfectly motionless on the ground provide protection from would-be predators.

The species is well named "*vociferus.*" When approached, it gives out a vociferous, shockingly loud distress call: "Kildee, kildee." After the cry, it takes off in frantic alarm, then returns and issues the call again and again. If the intruder gets too close to the nest, the killdeer may pull its broken-wing act. The behavior is aimed at decoying or luring the enemy away from the eggs or chicks. When the killdeer judges the intruder is far enough away from the nest, it suddenly gets well and leaves the would-be enemy. Both parents play the wounded-bird act.

The killdeer's diet is about 97% insects. Many of the insects eaten are crop pests. One study showed beetles constituted 37.06% of the killdeer's diet. Another study during an infestation of grasshoppers in California found that the contents of one killdeer's stomach were 100% grasshoppers. Researchers estimated that each killdeer averaged 33 grasshoppers daily. This is one way nature polices insect populations and also aids man.

Besides man, the killdeer has few enemies. Larger hawks or owls may occasionally take one, but the killdeer is apparently not considered choice prey.

The killdeer is now on the Federal Migratory Bird Treaty Act's protected list—where it should remain. With enlightened public opinion and knowledge of its beneficial attributes, it seems the killdeer will always remain a joy to nature lovers and a help to farmers. ■

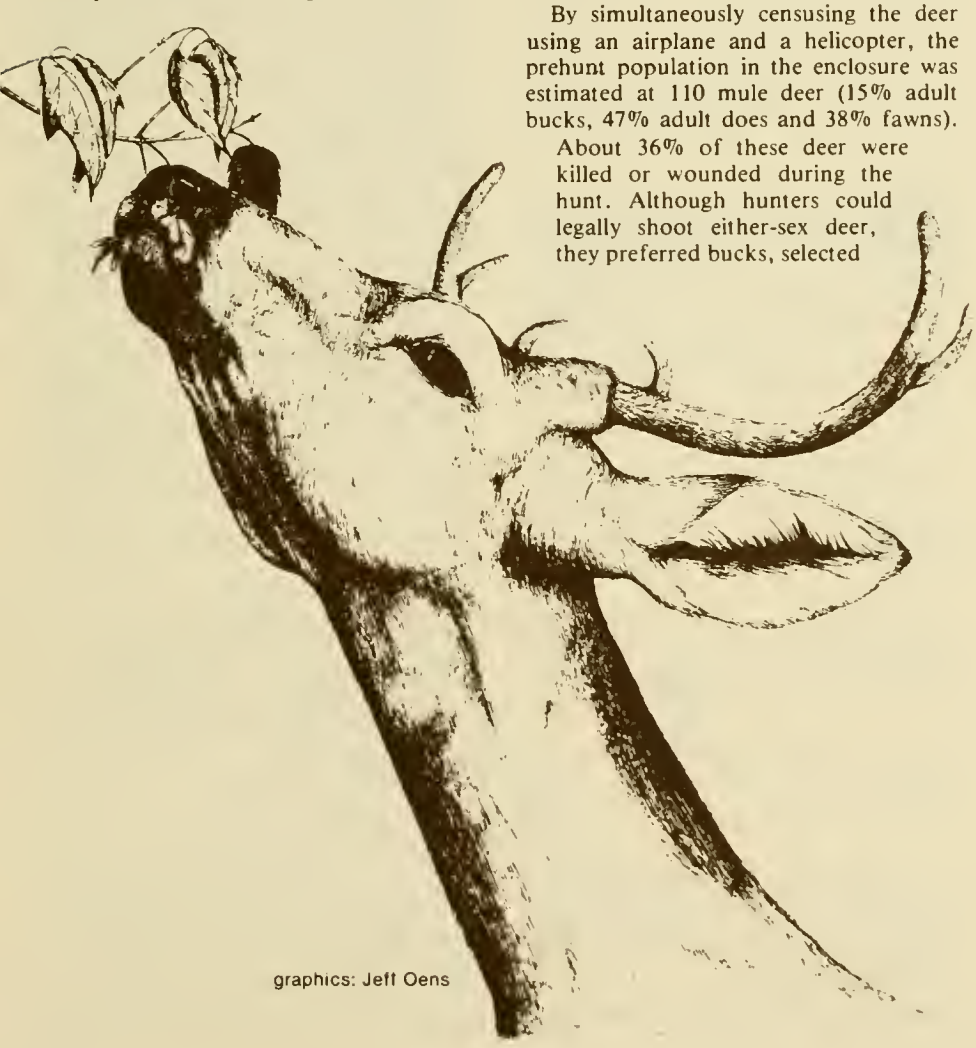
Big Horn Game Ranch Hunt

During the 1979 general deer season, Department of Fish, Wildlife and Parks personnel monitored an either-sex mule deer hunt within the eight-foot woven wire fence on the Big Horn Game Ranch. The ranch is situated in Big Horn County, 16 miles north of Hardin. The season was open to all holders of valid 1979 deer "A" tags. Personnel at the ranch granted permission to hunters and helped distribute them. The hunt was one of several steps in the continuing negotiations between the department and Big Horn Game Ranch personnel prior to issuance of a game farm permit valid for mule deer.

Since the fenced area enclosed nearly 30 square miles of land with hunting conditions similar to those occurring throughout eastern Montana, an excellent opportunity existed for biologists to observe both hunter and deer behavior during the hunt. Such information is important for intensive deer management. With cooperation of personnel at the Big Horn Game Ranch, all hunters completed questionnaires about their hunt and all harvested deer were examined to determine age, sex and weight. Department personnel surveyed the area three times by airplane and Big Horn Game Ranch personnel surveyed it once in a helicopter.

Seventy-four hunters (90% from Big Horn and Yellowstone counties) hunted a total of 84 days and harvested 34 deer (nine adult bucks, 17 adult does and eight fawns) for an overall success rate of 46% at a rate of one deer killed for every 2.5 days hunted. An additional six deer were reported or observed wounded, but it is not known if these animals survived.

By simultaneously censusing the deer using an airplane and a helicopter, the prehunt population in the enclosure was estimated at 110 mule deer (15% adult bucks, 47% adult does and 38% fawns). About 36% of these deer were killed or wounded during the hunt. Although hunters could legally shoot either-sex deer, they preferred bucks, selected against fawns and shot adult does in about the same proportion as they occurred in the population.



graphics: Jeff Oens

Sixty-four percent of the hunters indicated they were not selectively hunting for a buck. It was interesting to learn that nonselective and selective hunters ("buck" hunters) were very similar in the following categories: (1) number of hours hunted from vehicles, (2) number of hours hunted afoot and (3) number of deer seen per outing. Hunter success was the only category separating the nonselective hunters (50% success) from the selective hunters (23% success). Inexperienced hunters (those who had not killed a deer in the past two years) were less successful than experienced hunters, 38% vs. 47%. Surprisingly, the inexperienced hunters had a lower wounding rate, 10% vs. 27% (assuming the inexperienced hunters knew when they had in fact wounded a deer).

The time of the season hunted also influenced hunter success. Antlerless deer became more wary as the season progressed. It took 10.2 hours of hunting for each antlerless deer bagged during the first third of the season, 17.9 hours during the next third, and 21.2 hours during the final third. Bucks, however, became less wary during the last third of the season with 28.2 hours of hunting required per buck bagged, compared with 47.4 hours in the first third. The more aggressive and less wary behavior can probably be attributed to the rut. No bucks were shot during the middle third of the season.

The deer definitely responded to the hunting season by using tree-covered hillsides to gain better cover and protection. During the preseason flight, 81% of the deer were in creek and coulee bottoms and 8% were on hillsides; 31% of all deer observed were within 100 yards of pine trees. Flights made during the season showed only 11% of the deer in creek and coulee bottoms and 71% on hillsides; 81% of all deer observed were within 100 yards of pine trees. Hunters reported that 74% of the deer they shot were within 100 yards of pine trees when first seen.

The type of information gathered during the study is extremely valuable for deer management, but it is usually difficult to obtain because biologists rarely have an opportunity to observe a contained deer herd of a known size and composition and to conduct an interview where 100% of the hunters are contacted.

RECYCLED PAPER

Some of the practical applications of this management information include: (1) more accurate hunter kill figures when at least an estimated wounding rate can be included, (2) knowledge about the degree of hunter selection which allows biologists to better determine the effect of either-sex hunting seasons on age and sex ratios, (3) the increased vulnerability of bucks during the rut which indicates hunter success would be reduced by excluding the Thanksgiving weekend from the hunting season, (4) what proportion of a mule deer herd can be harvested in a given area with either-sex hunting, (5) a basis for comparing responses of mule deer to hunting in this pine breaks area with deer responses in other types of habitat and (6) determining the vulnerability of deer to hunting in the various habitat types.

Montana hunters have varied opinions about this kind of a hunt—it was not as simple as most hunters thought a "fenced-in" hunt would be. Regardless of your opinion, be assured that biologists used the situation to gain valuable information that will allow better management of unfenced mule deer populations.—*Jon E. Swenson, wildlife management biologist, Rosebud*

Rehmann Named MWF Director

The Montana Wildlife Federation has a new executive director: Wilbur Rehmann.

Rehmann brings the perspective of a diverse background to the job: growing up hunting quail and pheasants in the Midwest, attending the University of Iowa and participating in the Writers' Workshop, working for an advertising agency, obtaining a degree in humanities from the New School for Social Research and doing graduate work in philosophy. In between, Rehmann traveled to Montana for frequent hunting, fishing and sightseeing trips.

He liked what he saw and moved to Montana in 1972. He and his wife, Janet Benson, moved to Hot Springs in 1977 and bought a 40-acre hay unit. While in the Hot Springs area, Rehmann worked for the Eastern Sanders Conservation District as an administrator and technician and learned about soil conservation and management practices. He also developed water quality plans for Sanders County, later working on the Flathead Area 208 Board as Sanders County's representative.

Rehmann joined the Department of Natural Resources and Conservation in 1977 as a range specialist and worked with state grazing districts in eastern Montana. He was later promoted to project manager on the Kootenai Falls hydroelectric project.

His employment with the MWF became official in October and he is looking forward to working with the various clubs and other sportsmen across Montana. He can be reached at the Helena MWF office (P.O. Box 901; Helena, MT 59624), or by telephone at 406-443-0326. He's anxious to hear your ideas.

Caverns Open May 1

Lewis and Clark Caverns State Park will again observe the traditional May 1 opening. Guided tours will be offered daily through Sept. 30.

An information center marks the entrance to the park on U.S. Highway 10, 17 miles west of Three Forks. A scenic three-mile entrance road—with a campground, picnic areas and a self-guided nature trail along the way—leads to the visitor center and cafe/gift shop.

The two-hour, two-mile guided tour of the caverns begins after a short walk on a developed trail from the visitor center to the cavern entrance. Descending through the underground caverns, tourists enjoy a discussion of cave geology and history while viewing the beautiful rock formations. Visitors should wear sturdy walking shoes and bring a jacket or sweater and flash attachments for cameras.

Tickets are available at the visitor center at a cost of $2 for adults and $1 for children aged 6-12. A special group rate of $1 per person is available for groups of at least 15 persons making reservations two weeks in advance. The cafe also offers group meal rates. For reservations or additional information, write: Lewis and Clark Caverns State Park, P.O. Box 1024, Three Forks, MT 59752, or call park headquarters at 406-287-3541.—*Dave Todd, park manager*

Wildlife Shorts

Within one country, a species may have different local names. For example, in the United States, the mallard duck is also called wild duck, greenhead, grey duck, English duck, stock duck and many other names.

* * * * *

Centipedes live mainly in warm areas, by day hiding under stones or logs and at night moving swiftly about to prey on earthworms and insects.

* * * * *

Throughout the world, commercial fishermen annually take over 35 billion pounds of fish worth over $800 million.

* * * * *

Some primitive peoples use snake venom to prepare poisoned arrows for killing game and for warfare.

* * * * *

An animal that consumes another animal is called an enemy or a predator, and the animal eaten is its prey.—*Vince Yannone, youth educator, Conservation Education Division*

What Do People Think?

A group of sportsmen leaders from around the state recently met in Helena to hear about the department's financial problems and proposed license fee increases. Since the license proposal is currently under consideration by the Montana Legislature, some of their comments should be of interest.

While participants generally supported the department's need to raise hunting and fishing license fees in order to keep up with inflationary pressures, individual comments indicated a diversity of opinion about specific license increases and related department expenditures. For example, some of the comments included:

- Licenses for nonresident fishing could be higher.
- Legislators should consider a conservation resource trust fund to generate interest money to be used by the department for operations and other purposes.
- The cost of the sportsmen's license could be higher.
- Late season hunters should have to pay separate fees of $50 to $100 to hunt in the late season elk hunts.
- The department should not become too top heavy in administration. Field personnel and those who have public contact are particularly important aspects of the agency.
- The department must continue to stress landowner/sportsman relations.
- Some feared license increases would possibly mean less hunters in some areas due to the higher expense.
- The ex officio warden program needs emphasis and law enforcement in general requires proper funding.
- Raise youth license fees to full adult fee levels.
- Computer drawings may be too expensive.
- Increase outfitters' fees.
- Establish a trophy fee for moose, sheep and goat and allow one-time kill only.
- Do park users pay?
- Hunters need to improve their ethics.
- The department should reinstate the traveling fair exhibit.
- All programs should be self-supporting, subject to reason.
- A department that generates its own income should be able to collect its own interest.
- A cooperative habitat improvement program with landowners is needed for wildlife habitat.

Sportsmen who participated came from all parts of the state. After a presentation

on the financial situation the department faces, most concurred that more money is needed to support the important public services of wildlife management, habitat protection and enhancement, law enforcement and public awareness programs.

But how do Montana citizens in general feel about the money issue the department faces? For answers to this and other questions regarding several outdoor recreation management issues, let's take a look at results from an extensive attitude survey of Montana residents.

The telephone survey of public attitudes was conducted by the University of Montana's Bureau of Business and Economic Research at the request of the department to obtain information that can assist in planning for the 1981-83 biennium. It represents a statistical cross-section of all Montana residents. Telephone numbers were randomly selected by computer.

Highlights of the survey relative to funding issues included:

- Forty-six percent of the respondents feel user fees should fund the department.
- Seventy-one percent feel license fees should be increased to fund the rising cost of fisheries programs.
- Forty-eight percent do not favor limiting resident hunters, while 86% do favor limiting nonresident hunters.
- Seventy-two percent oppose more emphasis and funding for nongame programs.
- Some 52% feel the department should continue purchasing land for wildlife management purposes. (Sixty percent of those who responded to this question stated they hunted in Montana in 1979.)
- Regarding hunting license fee increases, 69% said the fees should be increased to fund rising costs of wildlife programs, and 60% feel that *both* resident and nonresident fees should be increased. Only about 3% feel resident licenses only should be increased, and 35% feel nonresident licenses only should be increased.
- Fifty-one percent feel friction between landowners and recreationists is a serious problem, and 75% feel the department should negotiate easements across private lands for public land access.
- Sixty-one percent also feel that a financial incentive should be provided to landowners for maintaining wildlife habitat and allowing public access.
- Although 57% favor increasing fees to cover additional law enforcement costs, 61% feel overall department enforcement efforts are adequate now. Forty-one percent feel public reporting of fish and game violations should be emphasized as an alternative enforcement program, while 23% feel more information is necessary to aid enforcement.

Survey results indicate that Montana citizens are willing to pay the price for quality outdoor recreational opportunities, but landowner/sportsman problems still need to be emphasized in department programs.

Results of the meeting with Montana sportsmen and the attitude survey both indicate broad public support for license fee increases which will continue to adequately fund department programs. Montanans —including hunters, fishermen and other outdoor recreationists—want the department to meet the challenges of the future, and they are willing to pay for it.

Department Film Wins Awards

"Who Will Answer?" a documentary produced by the department's Motion Picture Production Unit, received a silver award from the 1980 International Film & TV Festival of New York. In addition, the film earned special recognition from the World Wildlife Film Festival in Reno, Nev., for "Best Portrayal of the Sportsman in Wildlife Management."

The film was directed by Craig Sharpe, a former department employee, and Mike Gurnett, present film production manager.

The movie examines the relationship between man and wildlife and the future of that relationship. It looks at the reasons why hunting and fishing are vital forms of recreation for millions of Americans and stresses that, more than ever before, wildlife and the wild places it inhabits are threatened. And, as the movie emphasizes, the threats don't come from those with a rod and rifle, but from those who would exploit wildlife habitat.

"Who Will Answer?" is available free for scheduled showings from the Film Center, Department of Fish, Wildlife and Parks, 930 Custer Ave. W.; Helena, MT 59601.

Book Reviews

THE HIKER'S GUIDE TO MONTANA, edited by Bill Schneider, Falcon Press Publishing Co., Inc., P.O. Box 731, Helena, MT 59601; 1979, 214 pages, $6.95 paper.

The best directions come from somebody who knows the country. Anyone knows that. And any hiker knows it would be impossible to find one person who could give detailed directions to all the backcountry trails and cirque lakes of western Montana.

That's why Bill Schneider went to two dozen sources when he put together "The Hiker's Guide to Montana."

About two years ago, Schneider approached hikers throughout the state and asked them to write about their favorite trails. He collected and edited the stories and put together a mixed bag—80 hikes described by 24 veteran hikers.

The result is a book that's about as useful to hikers as "gorp," or whatever you call your mixed trail food. The trail food in "The Hiker's Guide" includes a hike for just about anybody—short overnighters, day hikes and major treks.

But more important than the selection, you can believe what you read. continued

If you're planning to move in the near future, please attach the label from your last issue and send it and your new address to *Montana Outdoors,* Department of Fish, Wildlife and Parks; Helena, MT 59601. Please allow six weeks for the change to appear on your magazine label.

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Attach label from last issue here

When Elaine and Art Sedlack of West Glacier tell you that Marion Lake near Essex is a nice day hike for a family, you can be sure they're right. The two have worked and lived in and around Glacier National Park for years.

When Schneider describes the Nyack Loop Trail through the southwestern part of Glacier as a trip that could ". . . turn out to be the backpacking vacation of your life," believe him.

And you can be sure Herb Gloege of Helena knows what he's saying when he describes a segment of the Red Mountain Trail: "The trip from the saddle to the summit goes through a forest of veterans of a war against the long, cruel winters at this 8,150-foot altitude. Some of the trees are more ghostly than the ghost town [Rimini] below."

Reliability isn't the only benefit of Schneider's approach in "The Hiker's Guide." Since, in a sense, the book is a cooperative effort of 24 people, you end up with a variety of styles and ideas. The hikes aren't all "destination trips," where you hustle eight miles into Lake Beautiful, missing everything along the way.

And no author is short on enthusiasm as he or she describes a favorite hike. It's hard to ignore their excitement. In fact, it's catching enough to make you want to take out a backpack and fiddle with the straps, or check your soybean or oatmeal supply while you plot a Continental Divide sabbatical.

Schneider's hikers even sneak in some down-home humor. Gloege says of his Red Mountain trip: "To start this hike, drive . . . to the ghost town of Rimini. (Don't fret—Helena commuters have moved in and driven out the ghosts.)"

In general, "The Hiker's Guide to Montana" promises to include trips for all kinds of hikers—beginners, families and experienced backpackers.

It does that.

Leafing through its 214 pages, you'll find a variety of trails described, taking you to places like the Chinese Wall, the Lake Plateau country, Great Northern Mountain and Mount Helena City Park.

You'll also find small, but handy, U.S. Geological Survey or Forest Service maps of each trail. You could probably throw the 13-ounce guide into your pack and get by with the maps. But few weight-conscious hikers would make the sacrifice, especially if it meant leaving a freeze-dried meal behind. Anyway, you'd be better off with a full-sized map.

That brings us to a couple of shortcomings of the guide.

One, it's not freeze dried.

Secondly, most backpackers will find one of their favorite retreats included.

So, the secret's out. But what's better than sharing Montana's backcountry with another hiker? Just so it's not at the same time you're there.—*Dave Shors, outdoor editor, Helena Independent Record*

MOOSEWOOD COOKBOOK, by Mollie Katzen, Ten Speed Press, Box 7123, Berkeley, CA 94707; 1977, 221 pages, $7.95 plus 50 cents postage, paper.

If you travel to Ithaca, New York, and just happen into the Moosewood Restaurant for lunch and are served a hearty bowl of Hungarian mushroom soup accompanied by blue moon waldorf salad, you're probably going to wonder who conjured up these unusual dishes. Since there is no head chef, the credit must go to many who cook—and have cooked—at Moosewood. The Moosewood cuisine has evolved from these talented folks, who bring together their personal culinary heritage gathered from family and friends. (Many of their respective grandmothers' recipes are featured.) These cooking styles are passed back and forth and mixed with library research on foods of other countries to finally produce an "eclectic cuisine, with vegetarian, international emphases, using the freshest ingredients available."

One problem. For those of us living in the West, Ithaca and Moosewood seem about as far away as the moon. But thanks to the efforts of Mollie Katzen, herself a Moosewood cook, we can enjoy the Moosewood creations in our own kitchens via the "Moosewood Cookbook."

The book itself is delightful—entirely hand-lettered and sprinkled generously with whimsical graphics by the author. The recipes are intriguing—apricot-almond bread, Balkan cucumber salad, vegetarian chili, vericheesey casserole, cauliflower-cheese soup, stuffed winter squash and, for the sweet tooth, apple-cheddar strudel, to name a few.

But more important than the appealing format and exotic foods is the fact that Moosewood creations (all vegetarian) are based on wholesomeness. And in today's world where much of our food is peppered with preservatives, dyes and all sorts of unpronounceable chemicals, this alternative is refreshing. As Mollie Katzen explains, "The reasons are various, ranging from simplicity of one sort (health, lightness, purity) to simplicity of another (convenience, economy). We also want to spread the notion that protein and aesthetics need not be sacrificed when you leave meat out of a meal."

Now, for all of you whose taste buds have settled into a routine of meat and potatoes varied with fast-food burgers, treat yourself to a dish of chilled-dilled soup, custardy popovers, carrot cake and your own personal copy of the "Moosewood Cookbook." Your body will thank you for the good things you put into it.—*Donita Sexton, art director*

A message on firearms safety

#4

in a series from the National Shooting Sports Foundation

Basics of Handgun Safety

As with all guns, there are basic, common-sense safety rules which should be followed by all handgunners

One of the primary rules of handgun safety is never to handle a handgun without opening it yourself to see if it is loaded If you find it is loaded, make sure you unload it unless you intend to shoot it

When it is absolutely necessary to carry a loaded handgun, it is especially important always to carry loaded revolvers with the hammer resting on an empty chamber Pistols can be carried with the magazine inserted, but the chamber should always be empty. These precautions also provide an added measure of safety if the handgun is dropped Regardless of how it is carried, however, observe the empty chamber rule.

Never point a handgun at anything you do not intend to shoot And always keep your finger off the trigger until you are ready to shoot

Some of the other basic rules which should be followed when using handguns are.

- Never have a loaded handgun in a house, car, boat or RV
- Never rely on a handgun's safety A safety is only a mechanical device, not a substitute for common sense.
- Never play with a safety, moving it from "safe" to "fire" and back again. Never pull the trigger with the gun on "safe." It could fire when the safety is moved to "fire" without the trigger being pulled again.
- Always load your handgun only when on the range or in the field and ready to shoot When you stop shooting, unload before leaving the field or range.
- Always keep handguns and ammunition in separate locked storage.

By following these simple, common-sense rules, you'll be doing your part to keep handgunning a safe sport

"Trophy Mule" by Robert Spannring; courtesy of Mr. and Mrs. Joe Duncan

Conflict for Space

by David F. Pac and Richard J. Mackie

THE MULE DEER, like any terrestrial wildlife species, is a product of the land; its fortunes are inseparable from events that influence the quantity and quality of its habitat. In the past, we have tended to view deer "habitat" largely in terms of providing the basic requirements of food, cover and water. While these are certainly necessary, there is another important requirement necessary for wild, free-ranging mule deer populations: *space*, or simply room to live.

Space and abundant wildlands have always been taken for granted in the West, especially in Montana. In an indirect way, they have been among our most valuable resources, giving Montana a special character, a unique freedom, and setting it apart from most other parts of the country.

But Montana has been rediscovered. In recent years, our glittering mountain valleys, like a handful of high-country jewels, have attracted more and more people. In the last 10 years, the human population of Montana has increased from 694,000 to 784,000 —nearly a 13% increase. More significantly, however, there has been a pronounced shift from urban areas to the rural countryside surrounding them. This has been especially true for cities situated in western Montana mountain valleys, such as Bozeman, Livingston, Helena, Missoula and Kalispell (Fig. 1).

Urbanization, which began in the valleys, is now spreading into the mountains and foothills. Most developments have taken the form of subdivisions on agricultural, range and forest land. Rural subdivisions all require space—the same space that provides essential habitat for mule deer and other wildlife. The Bridger Mountains are a case in point.

THE BRIDGER MOUNTAINS

The Bridger Mountain Range, which encompasses about 500 square miles, lies immediately north of Bozeman in Gallatin and Park counties (Fig. 2). It is one of several mountain ranges that provides superior habitat for mule deer in the central and southwestern part of the state. Indeed, the Bridgers might be considered "blue ribbon" habitat in terms of their potential to produce and support mule deer. The recreational importance of mule deer in the Bridgers has been evident for a long time. From 1957-74, the average deer harvest from this area made up 3% of the statewide total, while the range itself accounts for only ⅓ of 1% of the total land area of Montana.

The southwestern portion of the Bridger Range lies near the city limits of Bozeman. The southeastern portion arcs around the city of Livingston. Human populations have increased considerably in the area in recent years, and rural subdivisions are now scattered across formerly undeveloped land. In the last 10 years, the population of Gallatin County increased 28.4% while that of Park County increased 13.3%. If present trends continue, even more develop-

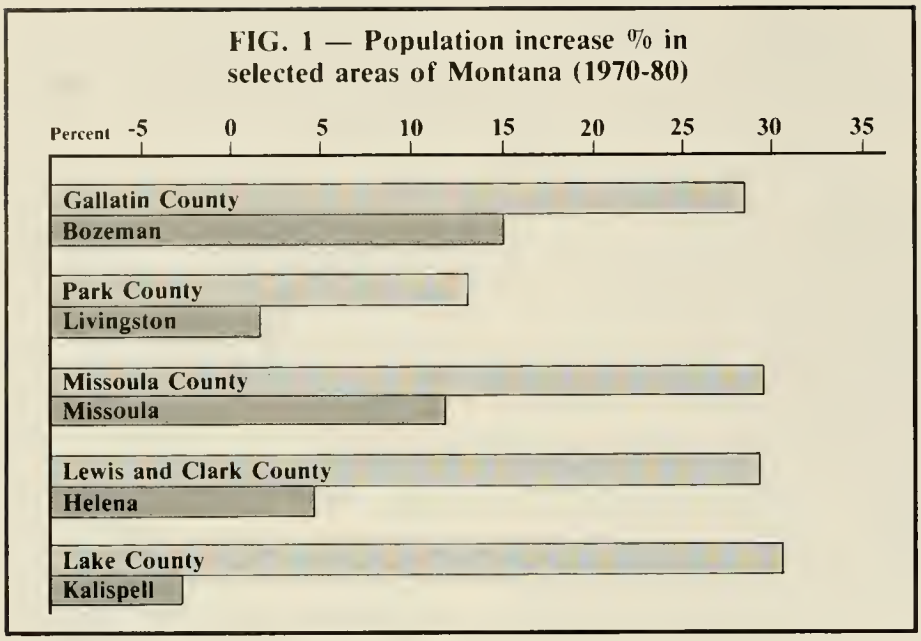


FIG. 1 — Population increase % in selected areas of Montana (1970-80)

ment is likely in these and other parts of the Bridger Range.

Because the Bridger Range is characterized by long, cold winters with deep snow, mule deer populations there depend upon the availability of suitable winter range. These areas occur primarily as a result of natural topographic, climatic and vegetative features. They cannot be constructed or greatly extended by man, nor can they be moved.

Seven major winter ranges, used extensively by mule deer from December through April, are located along the lower slopes of the mountains (Fig. 2). These ranges, although they represent only about 20% of the total area used by deer over the course of the year, are crucial.

The winter ranges vary in size as well as topography, vegetation, climate and land use practices. The most restricted ranges occur along the west slope, where a narrow band of steep, open slopes faces south and west, ranging in elevation from 5,200-7,200 feet.

Winter ranges along the east and north sides are much larger. They consist of gently sloping, open ridges and benchlands at elevations between 4,800 and 6,200 feet. They are available to deer because of light snowfall and winds that prevent snow from accumulating.

Because of the limited area, the west slope ranges normally have higher deer densities (varying from one animal per five to eight acres when all of the winter range is available, to one animal per one to three acres when severe weather causes concentration). On the more open east slope winter ranges, deer are more widely distributed and densities are relatively low (one deer per 25-30 acres).

More than 90% of all deer winter range in the Bridger Mountains is private land. National forest lands are found mainly in the central core of the mountains at elevations above 6,000 feet. The eastern two-thirds of the area consists of a checkerboard pattern of public and private lands. Most of the Bridger Range is accessible from cities and towns over a network of roads extending around and through the area.

DEER HABITAT USE

As explained earlier, the winter ranges are only part of the total area used by deer in mountainous areas during the year. The year-long habitat use of a Bridger deer population can be viewed as a wagon wheel, with the hub representing the winter range. Deep snow at higher elevations forces the population to concentrate at the hub year after year. When spring arrives, each individual deer moves away along one of the spokes of the wheel to its own small summer home range. An individual deer uses the same summer home range each year, and even the same travel route that connects it to the winter range. The rim of the wheel forms the outer boundary of the entire area used by the population during the year. We refer to this entire unit (the complete wagon wheel) as the *herd range* of a single population. Loss of the winter range (the hub) will result in the loss of deer from the total herd range.

The seven herd ranges that exist in the Bridger Range (Fig. 2) are not all the same, and deer respond to this variation in different ways. Mule deer within the three west slope herd ranges live longer, but raise fewer fawns than deer in the other four herd ranges. West slope populations also have smaller home ranges, show less seasonal movement and exhibit higher winter densities. Because of this, we believe that deer in west slope populations respond more slowly to changes in habitat conditions, both favorable and unfavorable. They declined more slowly during the widespread decrease in mule deer numbers of the early 1970s and have responded only slightly to more favorable conditions in the late 1970s. Mule deer populations on some herd ranges along the east slope of the Bridgers have more than doubled since 1975. In early spring of 1980, prior to fawning, the total number of mule deer in the Bridger Mountains was estimated at 7,750. More than 12,000 deer—nearly 25 per square mile for the range as a whole—would be expected in the summer and fall of 1980.

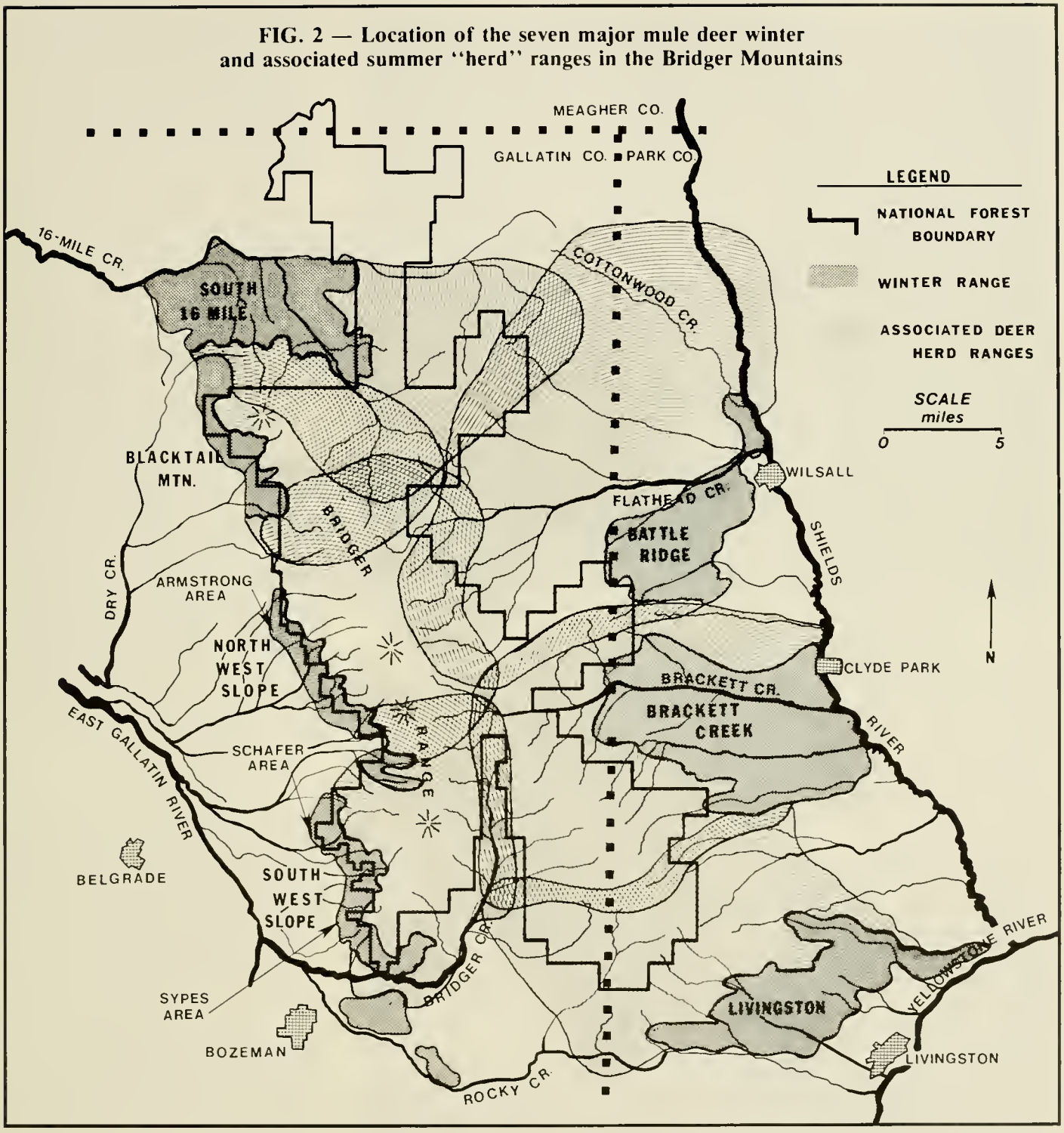
THE PROBLEM OF SUBDIVISIONS

The problem of subdivisions adversely affecting mule deer winter range is by no means confined to the Bridger Mountains, but this area seems to typify the problem. In the Bridgers, we have been better able to define and evaluate the problems and effects of subdivisions as a result of ongoing deer studies dating back to 1955.

Development or subdevelopment on and adjacent to mule deer winter range can affect deer in two ways: (1) direct loss of habitat, and (2) effects of human disturbance. Any decrease in the amount or quality of winter range, or the ability of deer to use it, will decrease the numbers of deer on that area and consequently on the summer ranges as well.

We are currently assessing the ef-

FIG. 2 — Location of the seven major mule deer winter and associated summer "herd" ranges in the Bridger Mountains



fects of subdivision on and near a portion of the Southwest Slope Winter Range (Fig. 2). Subdivision activity first began in this area in the mid-1970s in the vicinity of Sypes Canyon, within ½ mile of the winter range. Two additional subdivisions were recently approved on nearby tracts. One of these, a relatively high-density development with 27 lots on 58.06 acres, is immediately adjacent to primary winter range. Other housing developments are being considered along the entire Southwest Slope area.

The steep terrain on west slope winter ranges has prevented actual development on the primary winter range. Lower portions of the Southwest Slope Winter Range receive very little deer use because of the density of human development on these areas. The lower portions of other winter ranges where no development has occurred receive extensive deer use during early winter and spring. These areas are found as far as ½ mile from the primary winter range and add greatly to the overall quality of a mule deer winter range. continued

Winter ranges along the east slope of the Bridger Range are potentially more vulnerable to development as a result of their gentle relief.

HUMAN DISTURBANCE

Human disturbance associated with housing developments on or near mule deer winter ranges can prevent deer from using the entire winter range. In winter, mule deer continuously use more energy than they obtain from the food they eat. To survive, they must draw on fat reserves accumulated during summer and fall. They also conserve energy by lowering their metabolic rate and by following energy-efficient activity and habitat use patterns. Disturbances that continually increase deer activity will increase the rate at which energy reserves are used and decrease their ability to survive and reproduce the following year.

The activity and noise associated with subdivisions, together with various forms of harassment such as from free-roaming dogs, can cause deer to concentrate on portions of disturbed areas that still provide secure habitats. This can increase competition for food among the deer and force them to use marginal habitat at higher elevations. It can also result in their moving longer distances to feed at night when temperatures are lower and energy losses are higher.

On the steep, narrow west slope winter ranges, the effects of disturbance can easily spread across the entire width of the winter range. Eventually, the result will be the same as a direct loss of habitat, and the number of deer will decrease on the winter range.

The Southwest Slope Winter Range encompasses an area of nine square miles and is used by 600-800 mule deer. Effective loss of one square mile of this winter range could result in a loss of one-ninth of the deer population, or 65-90 animals. In summer, the Southwest Slope population moves to individual home ranges spread out over the southern part of the main Bridger Range, an area of 50-60 square miles. Because a particular deer population uses the same summer and winter habitats year after year, loss of one square mile of winter range could result in the loss of all adult animals from five to seven square miles of summer-fall habitat. However, a reduced deer density over a larger portion of the summer range would be more likely.

In the vicinity of Sypes Canyon (a portion of the Southwest Slope Winter Range where controversy recently developed concerning the location of subdivisions immediately adjacent to primary winter range), deer density averaged 25-35 deer per square mile during the 1979-80 winter. This compares with an average density of 65-90 deer per square mile across the entire Southwest Slope Winter Range. About 100 deer per square mile can be found along the Northwest Slope Winter Range, where no development has occurred. The natural characteristics of the Sypes area may be partly responsible for the lower winter deer density. But a more significant part of the difference is probably related to the disturbance associated with past housing development and human activity in the area. Deer equipped with radio transmitters in the Sypes Canyon area have displayed more erratic and extensive movements than radio-collared deer on other west slope ranges.

WHERE WILL THE DEER GO?

It is unlikely that mule deer possess the behavioral adaptability to move from their traditional winter range to an entirely different winter range. Their seasonal movements and habitat use are learned traits passed from one generation to the next. As it becomes increasingly more difficult for the deer to survive and reproduce under the conditions that exist on an area disturbed by subdivision, we would expect the population to gradually decline.

More than 90% of all deer winter range in the Bridger Mountains is on private land. National forest lands are found mainly in the central core of the mountains at elevations above 6,000 feet. The uses of private land, whether compatible or incompatible with mule deer, are determined almost entirely by private landowners. Much rangeland or agricultural cropland has a greater value, at least to many people, for subdivision and development of homesites. While range and agricultural land may bring $300-$1,000 per acre, subdividable land may be worth $2,500-$3,000 per acre, and much more when developed. Unfortunately, the presence of one subdivision often compels the owners of nearby lands to also sell for subdivision causing the habitat loss to "snowball."

What is the value of the mule deer resource that may be subject to loss through subdevelopments on winter range? In 1979, 13,500 hunter days were spent hunting mule deer in the Bridger Mountains area. This number, multiplied by a recent estimate from the state of Washington of $43 per deer hunter day, equals $580,500 generated by the Bridger deer herd in one year. But the value cannot be computed solely in terms of the animals immediately affected, because this does not take into account the many future generations of deer that could have been produced and enjoyed by people. The permanent loss of the area as mule deer habitat would be staggering.

These long-term benefits should be considered when decisions are made concerning subdivisions on mule deer winter range or other important wildlife habitats. Similar projections should be made of the long-term benefits of leaving the land in agricultural, range and forest usage.

THE FUTURE

Existing or planned subdivisions now pose a significant threat to many important deer and other wildlife populations in western Montana. To maintain these populations at levels adequate to provide traditional hunting, viewing and other human values will be a formidable challenge.

At present, state and local regulations are practically nonexistent for subdivision of tracts larger than 20 acres. (See "Rural Subdivisions and Wildlife Don't Mix," Nov./Dec. 1978 *Montana Outdoors*.) Without stricter subdivision laws and greater consideration of wildlife values in land use planning, it seems certain that our wildlife resource will diminish.

A large part of Montana's wildlife heritage is still intact, and it belongs to all of us. Montana is one of the few remaining states that still has the opportunity to decide the future of its wildlife heritage. What will *you* decide? ■

photo: Jerry Manley

Coyotes and Big Game

by Philip Schladweiler

THE QUESTION of whether coyotes should be controlled in an attempt to benefit game populations has been around for a long time. It arose with increased frequency after the presidential ban in early 1972 on use of toxicants for predator control on federal lands. Coyote populations probably increased in some Montana areas following the 1972 ban; however, the clamor that "we need to do something about the coyote problem" seems to have been far out of proportion to actual changes in overall coyote densities.

At about the same time, deer populations, especially mule deer, were declining in many parts of Montana. It seemed natural to assume a cause and effect relationship. This growing concern spawned the present study. Increases in coyote populations were reported throughout the western United States immediately after the 1972 ban and before coyote populations could possibly have responded. This doesn't mean that real increases in coyote populations didn't occur, only that the assumed cause and effect relationship was erroneous.

STUDY AREAS AND METHODS

Previous articles (see "The Wily, Wild Dog," *Montana Outdoors*, March/April 1978) detailed research study areas and methods, which will only be touched on here for background. Briefly, studies were conducted on a pair of study areas in each of three localities: (1) near Miles City in the shrub-grass prairie vegetation type, (2) north of Bozeman in the mountain-foothill type and (3) in the Missouri River Breaks at the upper end of Fort Peck Reservoir. On each area researchers determined the relative status and trend in populations of coyotes and their potential prey species. Research emphasized deer and antelope, especially fawn production and survival. Since rabbits and mice provide a large part of the coyote diet, their population levels were also studied.

We also studied the coyote's diet to determine changes in food habits in relation to abundance of prey species, especially the timing and extent of deer and antelope remains in the coyote diet.

The original plan was to gather this information from all areas for two

photo: Bill McRae

years, then control coyotes on one of each pair of the areas while continuing to gather this information from all six areas. For various reasons, this research was not carried out exactly as planned (which was just as well as far as results are concerned, as will be seen later).

BIOLOGY OF MONTANA COYOTES

During six winters, approximately 1,250 coyote carcasses were collected from various parts of the state. These provided data on sex, age, stomach contents and, in the case of females, reproductive performance the previous spring.

The sex ratio slightly favored males, which is similar to coyote populations studied elsewhere. The only cases in which other studies have found females to outnumber males were instances where coyote harvest by humans was heavy. This suggests that our samples came from only lightly to moderately harvested coyote populations.

As pointed out in many other studies, coyotes produce a large excess of young each year. But a high percentage of these are lost each year *whether man intervenes or not*. In the six winters that we made collections, coyotes less than 1 year old (pups of the previous spring) averaged just over 46% of all animals handled. Animals between 1 and 2 years old accounted for slightly over 28%, and those between 2 and 3 made up just over 10% of the total. Coyotes 3 years and older totaled only a little more than 15% of the six-year sample. The oldest animal handled was 11-12 years old. These results also suggest only light to moderate harvest levels and corroborate findings from other studies which show that adult mortality averages about 40% annually, even when no hunting or trapping occurs.

Among females examined, an average of 63% of *all* females in the six-year sample had produced young the previous spring, with litters averaging 4.6 pups. In many years, large differences in reproduction were apparent between yearlings and older females. Overall, only 44% of all yearling females had produced young. In two of the six years, no young were produced by yearlings, while over 80% of the yearlings in two other years produced young, and there were two years with intermediate reproduction levels. Years in which no yearling females had young also had a lower percentage of adults breeding, and vice versa. In two of the four years when yearlings did breed, they had litters similar in size to those of adults. In the other two years, yearlings' litters averaged more than one pup smaller than those of adults.

Information from this and other studies suggests that diet just before and during the breeding season largely dictates the percent of yearlings breeding, and litter size for all breeders. In a year with abundant food, nearly all adults and a high percentage of yearling females breed, and litter sizes of both groups are large. In a year with scarce food, the percentage of adults breeding is still high (75% or more), but litters are smaller and no yearlings breed. Normal years are intermediate, and our six-year average probably represents a "normal" year fairly closely.

We can calculate annual production and subsequent mortality in a stable coyote population by using our six-year average. For example, start with 100 adults (50 pairs) during the breeding season and assume this is the normal breeding season carrying capacity for this area. From age ratios, we can figure that roughly 40% will be yearlings and the rest older.

Sixty-three percent (32) of the females would produce litters averaging 4.6 young, or a total of 147 pups. However, before the next breeding season, 40 adults are going to die (40% mortality) whether humans kill any or not. To maintain a stable population, only 40 young need to reach their first birthday to replace the adults lost. The other 107 young die in the intervening time, again whether man kills any or not, for a first-year mortality rate of nearly 73%. Even in the poorest reproductive year recorded (no yearling females and only 78% of the adults breeding with an average litter size of 3.2) these same 100 animals would have produced 74 pups, nearly twice the number necessary to replace the adults normally lost.

Coyote food habits were determined from studying the contents of more than 900 stomachs and nearly twice that many scats (droppings). Although all seasons and study areas were represented, the number of samples from an area for a given season was often small.

Annually, mammals contributed the bulk of the food consumed on all areas. This was especially true in winter when other food was less available. Year-round and in all areas, either rodents (primarily mice) or rabbits were the most important single food. Seasonally, however, other foods became locally important as availability and abundance changed. For instance, in summer and fall, both grasshoppers and crickets and/or fruits became locally important in certain years. Similarly, deer were an important part of the coyote diet in some areas during certain winters, but were unimportant during other seasons. (The impact of deer in the coyote diet is discussed in more detail later.)

BIG GAME STUDIES

Differences in antelope and deer populations existed among the six areas studied. Antelope regularly occured on the two Miles City areas and on one in the Missouri Breaks. Coyotes were controlled on only one of the Miles City areas. We could find no apparent relationship between observed doe/fawn ratios and coyote control or the lack of it. The severity of the winter was more important in regulating antelope numbers on these areas than was the coyote population level.

White-tailed deer occurred only in bottomlands along the Missouri River, and along the Yellowstone and Tongue rivers near Miles City. As with the antelope, the coyotes did not appear to affect these deer and once again, the severity of the winter seemed more important in regulating their numbers than did coyote density.

Mule deer occur on all six study areas and, because of higher population levels, they provided the best information on coyote-ungulate (hoofed mammals) relationships. As with antelope and whitetails, mule deer on both Miles City study areas showed the same trend in population without regard to coyote numbers or control (coyotes were controlled on one area and not the other). From all indications, coyotes had no affect on these mule deer populations during the study period.

Coyotes killed mule deer of all ages in winter, and young fawns during spring and early summer on the remaining four areas. However, these impacts varied.

Coyote control inadvertently occurred on both mountain-foothill areas near Bozeman in late fall 1977 and continued through that winter and the following winter. Since both areas were controlled, it was necessary to compare deer population statistics with those from nearby areas with ongoing deer studies. Fortunately, there were three such areas, one immediately adjacent and two others within 30 miles.

Mortality of young fawns was not intensively studied on the mountain-foothill areas, but doe/fawn ratios in early winter were similar to those from nearby areas, suggesting a common factor was involved. However, overwinter fawn survival varied between the main study areas and those nearby in three of the six winters studied. For the most part, coyote predation appeared to be the factor responsible. The first two winters of study showed no major differences attributable to coyotes. In the third winter, we noted substantially higher fawn mortality on the main study areas. It continued at a somewhat higher level in the next (or fourth) year, although coyote control was begun that year. This was the first year fawn survival to early winter was better than mediocre, but this occurred *before* any control was undertaken. Coyote control continued in the following (fifth) winter, and the main study areas had lower overwinter fawn losses than two of the other three areas. The last winter of the study (1979-80) was a mild one and no coyote control was carried out. However, early winter doe/fawn ratios were high on all areas and overwinter fawn mortality was relatively low and almost identical on all areas.

Even in mild winters, most areas suffered some overwinter fawn losses. In average years, some adults are probably lost as well. Assuming that all coyote-killed deer had survived to the following fall, we made rough calculations as to the number of deer that would have been added to the harvest at a 10% harvest rate. Again assuming no losses and prevailing fawn production for each subsequent year, we calculated that a maximum of six, 17, 28 and 30 additional deer would have been harvested during the four years that coyotes apparently had an effect. Of course we know some natural mortality would have occurred. The hunting license fee from 30 deer tags would not go very far in financing a coyote control program, especially since these would probably represent a switch from unsuccessful to successful hunters, not new license holders.

Although coyotes reduced overwinter survival in some years in the mountain-foothill study areas, long-term deer population trends were similar whether or not coyote control was carried out. Environmental factors such as drought or severe winters are apparently much more important than predation in affecting long-term deer population trends.

The situation in the Missouri Breaks was somewhat different since no coyote control was carried out specifically for this study. Coyote hunting was allowed in all years, with no aerial hunting or trapping in that part of the area within the Charles M. Russell National Wildlife Refuge. All phases of the study were more intensively examined on these areas. Although the study began in 1976, coyote levels apparently were highest in 1975 and declined from then to 1977 with a subsequent increase to 1979. The 1979 level was approximately that of 1976. Although the reason for the high population in 1975 is unknown, the recovery in 1978 and 1979 coincided with an upsurge in both mouse and rabbit numbers.

Deer studies have been conducted on this area since 1960, giving a good record of population fluctuations. Records show high deer populations in 1960, a steep decline during the severe winter of 1964-65, and a steady increase from 1966-70 when levels approached the high of 1960. A severe decline occurred in winter 1971-72, with a slight further decline to 1976 and a rapid increase from 1977 on. Current levels are at least as high as in

"Environmental factors such as drought or severe winters are apparently much more important than predation in affecting long-term deer population trends."

1960 and 1970.

A relatively high level of coyote predation on deer was found during winter 1975-76 (66 deer). In 1976-77, only 20 coyote-killed deer were found despite more search effort, and only seven to nine were found in each of the following three winters. Similarly, coyote predation on fawns (from a few days after birth through early September) was relatively high at 36% in 1976, declined to 21% in 1977 and averaged about 10% in each of the following three years. These declining levels of coyote predation and coincident increases in the deer population occurred at the same time that coyote numbers were increasing, apparently in response to increased small mammal numbers. Remember, these changes occurred in the absence of formal coyote control.

"At present and with existing conditions, coyote control solely to benefit big game in Montana can be neither justified nor recommended."

In this area, deer populations have peaked at about 10-year intervals. It appears the most recent increase was delayed by predation, and deer populations did not increase until coyotes switched to a more abundant and easily obtained food source. Since deer studies will continue in this area and we will continue to monitor (although at a reduced level) changes in coyote and small mammal populations as well, we should have some answers about what happens when the small mammal prey of a fairly high coyote population declines. With a contingency plan for controlling coyotes on one of the areas, we could also study effects of control vs. no control in this situation.

In summary, as in the mountain-foothill areas, coyotes in the Missouri Breaks were probably depressing deer numbers in some (but not all) years. Yet even without coyote control, deer numbers reached high levels coincident with high coyote levels. Over the long run, environmental factors seem to affect deer numbers far more than predation.

At this point, we will look briefly at population dynamics of wild animals in general, and predator-prey relationships in more detail.

POPULATION DYNAMICS

We will be concerned here with the *numbers* of animals in a population and changes in these numbers over time. We've all heard that if you started with a pair of flies and all subsequent offspring survived, in no time we would be up to our knees (or deeper) in flies. And of course we all know about the legendary reproductive capacity of rabbits. Why then aren't we wading through swarming masses of either species? The answer is that a large number die and many factors play at least some part in this mortality. If a stable population of any animal species is to be maintained, the number of young surviving in any given year must only equal the loss of adults. Although annual adult mortality may be relatively high, an even greater proportion of the young are normally lost each year.

It doesn't matter what brings a population to its yearly low (just before the next generation is produced); if one thing doesn't do it another will, and the major mortality factor one year may be insignificant the next. This is called *compensation*—many mortality factors compensating for, or replacing, one another, at least to a certain point. Compensation allows hunting to replace a large part of the natural mortality that would ordinarily occur between fall and the production of a new crop of young. Since a certain proportion of the animals are going to be lost anyway, hunters may as well take a percentage of these.

Conditions vary between years and areas. Therefore, most animal populations fluctuate in numbers, both within and between years. These fluctuations are within definite limits imposed by the habitat and the population itself.

Among the various "natural" mortality factors that reduce populations are such things as parasites, disease, accidents, malnutrition, predation, winter weather and old age. In many instances, more than one of these may operate simultaneously. For instance, an undernourished animal might be subject to parasites, disease or predation that would not ordinarily present a problem to a healthy animal. The question then becomes one of sorting out these factors and deciding which might be the actual cause and which might be only symptoms of other ills.

PREDATOR-PREY RELATIONS

Predator-prey interactions are complex biological problems, and like all complex problems, there are no simple answers. When predators are mentioned, people usually think of some of the large predatory birds or mammals. However, the act of predation—the killing and eating of one creature by another—is not restricted to those animals well endowed with claws and fangs. The robin pulling worms out of your lawn or the frog snapping up insects in your favorite fishing hole are predators as surely as the wolf, cougar or eagle. Indeed, some plants fit the definition of predators. We do not ordinarily think of these species as predators simply because they are not eating those animals we covet for ourselves.

Where the prey are rabbits or mouselike rodents which fluctuate in a more or less "cyclic" fashion, the following predator-prey situation is typical. When conditions are right for an increase in the prey population, predators are incapable of preventing it and the prey population increases to a peak. Population levels may vary widely between these peak levels. Once peak levels are reached, some factor other than predation must intervene and reduce prey numbers before predators exercise any control. Predators begin to influence prey numbers during the prey's decline phase, and predation persists as a dominant and depressive mortality factor for some time after prey populations reach their low. In this way, predation increases the range of prey fluctuations by reducing their numbers below what would normally occur. It also lengthens the interval between peaks by prolonging the dura-

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Readers Respond

"Rattling for Bucks" Success Story

One evening in early November, I sat down to read the Nov./Dec. 1980 issue of *Montana Outdoors*, where an article entitled "Rattling For Bucks" by Ken Walcheck caught my eye. I have always hunted for whitetail bucks during the rutting season, but after reading this article I said to myself: "This has got to be one of the most fascinating techniques I have ever heard of—to call in a whitetail buck by rattling a set of horns together." The story was enough inspiration to send me off to the woodshed in search of my favorite set of deer horns and later to set out for what was to be my first "Rattling for Bucks" hunt.

Shortly after noon on Nov. 15, I said to my wife, "Dear, do you want to come along with me? I'm going deer hunting in the Swan Range." I knew this area very well and had recently found several fresh "scrape" areas, giving me a good indication there were bucks starting into the rut. My wife declined, replying, "We have company coming tonight and the house is a mess." With that I set out for the hills.

Arriving at my destination, I walked from my pickup to the area where I had seen deer scrapes earlier in the week. I noticed a tall larch, with a smaller fir alongside, situated on top of a knoll overlooking a small pond. This was the place I would eventually return to later in the day, so I left my set of horns under the fir tree, broke a few branches from the larch tree so I could sit down and still be hidden, and opened an area so I could see clearly in all directions.

I tried to avoid wandering around in this area as much as possible, and found a small fir thicket about a quarter of a mile away where I sat down against a big larch tree, laid my rifle beside me and fell asleep. Awakening quite chilled a few hours later, I realized that the day was getting short and that time was now working against me for what I had set out to do.

Quietly, I walked back to the knoll where I'd left the horns under the fir tree. Then I began to go over Ken's story in my mind, remembering the sequence of events to begin the hunt. I had brought along a pair of leather gloves, the set of deer horns, my gun (a 7mm Remington Magnum) and some camouflage material. I also remembered several other important factors, including location, a pine or fir thicket, underbrush and deer scrapes or concentrated sign on benches or knolls running parallel to main drainages. I remembered to reverse one antler so that the tines were all pointed in the same direction; however, I became concerned when I remembered the horns were a set and not a pair of two right or two left ones which was pointed out as being safest to use. Finally, I remembered Ken's comment about one never knowing how quickly or in what manner a buck will approach.

I sat there under the fir tree, the larch towering above it, anxiously waiting for the sun and its shadows to disappear. This was the moment I had chosen to begin my first attempt at rattling. As I listened eagerly for any strange noises from the thickets below, I could hear the caws of ravens by the pond and interrupting chirps from the squirrels gathering pine cone nuts for the winter months ahead.

The time was right for the first clacking of my deer horns. The woods were dry and quiet, and echoes could be heard at a great distance. I began to rattle and continued for several seconds, scraping the horns against the larch tree and breaking a twig from the tree branch by mistake. I put the horns down and sat and stared at the opening just above the tree line, knowing any second a mature buck would appear. I guess nearly three minutes went by and suddenly, from the opposite direction—my blind side—I heard a stomping noise. Almost without hesitation, I turned a complete 180 degrees to see a large whitetail buck snorting and stomping the ground about 30 feet away.

Vern Childers of Bigfork
(photo: Kent Stevens, Bigfork Eagle)

My first thought was to protect myself from this fight-thirsty animal, but my gun still lay on the ground under the fir tree. For a second I stared in disbelief that this could be happening to me, then I jumped out from under the fir tree. I continued to watch his every move as I bent over to raise the rifle from its place on the ground, when all of a sudden he jumped straight in the air and bolted toward a fir thicket. I took quick aim, firing once, watching as he crashed head-on into the brush and then to the ground. "The buck is dead," I said to myself, as I approached the area where I saw him tumble.

Not true, however; he bounded to his feet a few yards away from me. I fired again, delivering the killing slug. Little was I aware my first shot had only grazed him enough to knock him unconscious for a few seconds.

I can still remember Ken's comment that horn rattlers shouldn't become discouraged after one or two unsuccessful hunts, and that rattling wouldn't work every time; but I'll never forget this experience because I know now that patience and a little hard work go a long way.—*Vern Childers; Bigfork, Mont.*

License Proposal Raises Questions

I just received my Nov./Dec. 1980 *Montana Outdoors* and was scanning it when the article, "DFWP Faces Financial Crunch" (page 7), caught my eye. This article, together with a comment made by a game warden at the Glasgow regional office concerning the new proposed nonresident big game licenses for 1981 really stunned me. His statement, which I heard when I was in Montana last fall bowhunting elk, went about as follows:

"Well, you boys probably won't be coming back next year when the elk license goes up to $325. We're going to cut your quota to 12,000 hunters also."

My mouth fell open like a dumb fool and my heart hit bottom in the same in-

RECYCLED PAPER

stant. Half stumbling out of the office, many thoughts were racing through my mind. Why can't I come back to Montana? My hunting party of five had hunted the Missouri Breaks for 10 days and we had a wonderful time. Our bag had included one doe mule deer, one rabbit and six sharp-tailed grouse. Now we were being told in so many words that if we were lucky enough to be among the 12,000 people who will be chosen to finance the Montana Department of Fish, Wildlife and Parks for 1981 and if we had enough money, we might just get to hunt.

The article seems to confirm that the new increase is in the wind. Nonresident big game hunters will again be asked to pay the majority of the license fee costs used to run the department. But the real kicker is that only 12,000 people from outside will be able to hunt in the fourth largest state, a state in which 70% of the land is federally owned.

Since I am an accountant by profession, I thought the people of Montana should be informed as to who is paying the tab.

In 1978, nonresident big game hunters paid an estimated $3,947,950 of the total license fees of $7,466,184—over 53% of the total license fees for all hunting and fishing licenses sold in Montana. When comparing the 18,500 nonresident big game hunters to an estimated 125,000 resident big game hunters, the nonresidents —approximately 14% of all big game hunters in the state—are surely paying their share for wildlife management.

In 1981, I'm sure some nonresidents will again hunt in Montana and pay the bills, but the department's licensing system is both unethical and un-American. By revising the license system and selling big game licenses on a per species basis and promoting primitive arms big game hunting, more than 40,000 nonresidents could participate and the effects on the big game population would not increase current harvest rates.

The new system could generate license revenue estimated at $7.8 million, which could be used to benefit both the state of Montana and, most important, wildlife. Revenue generated in the form of gas, food, lodging, supplies, guide services and sporting goods and amounting to millions of dollars surely could be used by the people of Montana.

What is needed is for the department to start promoting the participating values of hunting, rather than trying to promote high percentage kill ratios. The present licensing system, with regard to nonresidents, has the following inequities. Maybe you could tell me why?

1. Why is Montana the only state where a nonresident bowhunter cannot come into the state and buy a license to hunt deer?

2. Why must a nonresident bowhunter currently pay $231 to hunt a deer with two pieces of wood and a string, in a state which has mostly public land and a low resident population?

3. Why is Montana's big game licensing system promoting hunting only for wealthy nonresidents?

4. Since nonresidents are paying most of the bills, why don't we have representation or have our views heard by the department and by the Commission?

Thank you for your time.—*Dave Nelson; Canby, Minn.*

* * * * *

• Your letter asks some good questions and makes some strong points—but it also contains some information that is not entirely correct. Before we address these points individually, we must emphasize that our department is facing serious financial problems. Since Montana's last significant license fee increase in 1976, escalating costs have outpaced license revenue income. As an accountant, you certainly understand the dilemma of trying to effectively operate an agency or business in 1982 or 1983 on a 1976 level of income. Without a fee increase in 1982 and 1983, we will face reductions in services and personnel that will greatly hamper our ability to maintain current hunting and fishing opportunities and to protect wildlife habitat.

Regarding the points in your letter:

". . . next year . . . the elk license goes up to $325 . . ." The department is *proposing* a license fee increase to the 1981 Montana Legislature. The proposal includes increases on resident and nonresident licenses and would raise the nonresident big game license (one elk, one deer, one black bear, bird hunting and fishing) from $225 (now) to $300 in 1982 and $325 in 1983. The only proposed increases for the 1981 hunting season would be the $1 conservation license going to $3 and a nonrefundable $5 application fee for resident and nonresident big game drawings. The Legislature, of course, may reject or modify any of our proposals.

". . . only 12,000 people from outside will be able to hunt in the fourth largest state, a state in which 70% of the land is federally owned." Montana is the fourth largest state, but it is not 70% federally owned. About 30% of the state is federal land. A limit of 17,000 nonresident big game licenses was imposed by the 1975 Montana Legislature. None of our employees had any basis for saying that the quota will be reduced by the department; only the legislature can do this. Montana citizens in general react to nonresident hunting pressure the same as citizens of other states: When increasing demand exceeds the supply of game, state residents generally opt for limitations on nonresident participation.

"Nonresident big game hunters will again be asked to pay the majority of the license fee costs used to run the department." We agree that nonresidents do pay a significant share of the fish and wildlife management costs. The U.S. Supreme Court recently upheld the right of Montana to charge nonresidents higher rates for hunting licenses. However, the proposed increases for 1982 and 1983 are intended to be spread across all license buyers. For instance, under the proposal, resident elk, deer, bear, bird and fishing licenses in 1983 would total $51, up 55% from the current rates. The same licenses for a nonresident would total $325 in 1983, up 44% from current rates. While these percentage increases may seem large, remember that the rates haven't been raised significantly since 1976 and that they mainly reflect inflationary increases over that seven-year period (1976-82).

"By . . . selling big game licenses on a per species basis and promoting primitive arms big game hunting, more than 40,000 nonresidents could participate. . . ." We already have separate deer and bear licenses; the elk license is the only one not separated out. The possibility of further separating nonresident licenses and establishing primitive arms seasons could be considered by the Legislature. For example, we have considered providing the opportunity for nonresident archers to purchase an archery elk tag for use prior to the rifle season. There are now (and will be more in the future) opportunities for nonresident archers to hunt deer in Montana for less than the $225 license.

"What is needed is for the department to start promoting the participating values of hunting, rather than trying to promote high percentage kill ratios." It is not accurate to state we have a policy of promoting high kill ratios. Our elk kill ratio, for example, is lower than that of many other western states. Our management goals emphasize the recreational aspects of hunting (we recently devoted a special issue of *Montana Outdoors* to the aesthetic values of hunting). Access to private lands is one of our major problems. In an effort to keep private land open (it sustains over 50% of the deer harvest and a substantial part of the harvest of other game species), we strive for higher success rates, fewer days afield and fewer return trips to keep landowner irritation to a minimum. On hunting units that are primarily public land, our objectives stress higher public participation and more recreation. We have problems with over-concentrations of hunters in some areas, despite being the fourth largest state and one with a low population.

Nonresidents are always welcome to present their views to the department and to the Fish and Game Commission. Thank you for your interest in Montana and our wildlife management problems.—*Ed.* ■

Some Nuggets Panned from Boone and Crockett

by Norman C. Roettger, Jr.
graphics by Robert Neaves

AN EVENING or two spent poring over the Seventh Edition (1977) of the big game records compiled by the Boone and Crockett Club, entitled "North American Big Game," will bring joy to your heart and a gleam—as well as some tiredness—to your eyes. How many times have you heard such accepted truisms as "the big ones are all shot out now" or "the hardest head to get in Boone and Crockett is the whitetail—or the elk—or the Stone's sheep, etc."? Some nuggets panned from Boone and Crockett's Seventh Edition will convince you that "'t ain't necessarily so."

I have broken down the results of my search into three basic sections: (1) The frequency from 1970-76 of a trophy making the top 20, (2) percentage of entries taken in a particular year and (3) your current chances of bagging #1 of a species. One quick disclaimer before we get started: I'm not a statistician. These observations weren't written for statisticians, but for my hunting friends.

I've gone over the lists of 22 selected species, including all of the sheep, moose, typical deer, caribou and most of the bears. Also included are the elk, cougar, Rocky Mountain goat and pronghorn. I have not included the animals we can't hunt or bring into the country now.

SO THE BIG ONES ARE ALL SHOT OUT

It seemed to me the easiest way to find out whether the big ones really have been shot out would be to check and see how many of the top 20 heads in each of these 22 species had been taken from 1970-76. It is important to remember that the Seventh Edition went to press in 1977 and doesn't have any entries after 1976.

These statistics ought to convince you that the big ones certainly are not all shot out. The following chart lists the number of top 20 animals of the various species taken from 1970-76:

Quebec-Labrador caribou	11
Grizzly bear	10
Black bear	9
Pronghorn	8
Cougar	8
Whitetail deer	7
Columbia blacktail deer	7
Canada moose	7
Alaska-Yukon moose	7
Desert sheep	5
Mule deer	5
Rocky Mountain goat	4
Woodland caribou	4
Elk	3
Stone's sheep	3
Barren ground caribou	3

There are some real surprises in that list, aren't there? Who would have expected that many record-book grizzly or black bears would have been taken in the

1970s? For example, four (#1, #2, #4 and #5) of the top five black bears were taken in the 1970s (and #3 was taken in 1968), as well as seven of the top 10, and nine of the top 20. For grizzly bear it's as good or better: four of the top six in the 1970s, including the #1 and the #2 trophies, and 10 of the top 20.

How about that many deer and moose being taken in the last seven reported years of hunting? Isn't it surprising to see three elk and Stone's sheep among the top 20 in the last seven years? But why should we be surprised—is it anti-hunting propaganda or the hunters' own dejection about not readily finding a super-trophy that causes us to believe "the big ones are all shot out"?

Six species are not listed. Four of them (mountain caribou, Coues' deer, Dall's sheep and Wyoming moose) had only one or two of the top 20 taken in the 1970s. No bighorn taken since 1969 and no brown bear taken since 1966 has made the top 20 list. But we know a very large bighorn sheep—possibly the largest in Montana in a decade and probably in the top 20—was taken near Thompson Falls, Mont., in 1979 by Armand H. Johnson of Missoula (see *Montana Outdoors*, Jan./Feb. 1980). As this magazine went to press, its final Boone and Crockett status had not yet been announced.

WHERE SOME POPULAR SPECIES ARE FOUND

In view of the great interest sportsmen have in hunting the elegant but elusive elk, I scanned the records to find some area harboring a disproportionate number of record book-quality elk taken in the 1970s. By far the largest number from any one state came from Montana, with 10. Then came Colorado with six; Arizona with five; Idaho and Alberta with four; Wyoming, surprisingly, with only two, and Oregon, Washington, New Mexico and Manitoba chipping in with one each.

The whitetail deer has such an extensive range that it is difficult to find any patterns at all. But one obvious fact stands out: The whitetail deer is not only surviving and thriving nearly everywhere in America but there are book-quality specimens now found almost everywhere. For example, the top 100 whitetail deer in the Seventh Edition were taken in 22 states and four provinces. Texas led the list with 13; Minnesota followed with 12; then the numbers dropped sharply to Saskatchewan with eight; Iowa, Missouri and Wisconsin with seven each; Montana with six, and Kansas and (surprisingly) Ohio each with five. In fact, 70 of the top 100 whitetail specimens were taken in those eight states and Saskatchewan. If one obvious pattern emerged, it is that, except for Texas, those whitetails grew big in the breadbasket of North America.

During the 1970s, Pennsylvania, Maryland and Indiana crashed the ranks of states with whitetails in the top 100. And Indiana's entry made the top 20. Of the trophies in the top 20, Texas led with four, while Minnesota, Missouri, Montana, Kansas and Saskatchewan each chipped in with two.

When one looks at the second 100 whitetails of the top 200, the states of Virginia, Michigan, Wyoming, Idaho and Washington and the province of British Columbia are added to the list. The last four locales are surprising, since they are normally the habitat of the muley or blacktail, not the whitetail.

One last observation: Not only is the whitetail widely distributed, but big whitetails are becoming more common—23 of the top 100 were taken in the last seven years of record, but even more impressive, seven of the top 20 were taken during that period.

PERCENTAGE OF ENTRIES TAKEN IN A PARTICULAR YEAR

As a further check, I picked one year—1974—to see how many animals of the 22 species made Boone and Crockett listings that particular year. I selected 1974 because I thought there may have been fewer entries in 1975 and 1976 due to the short time between those years and the time the Seventh Edition went to press. In comparing the number of entries in Boone and Crockett for 1974 with the total number of entries for that particular species, I found that 1974 contributed remarkably close to 3% of the total for each species. In fact, the animals taken in 1974 for 17 of the 22 species ranged from 2% to 4% of the species' total book entries.

From the previous tabulations you can almost predict which species were above 4% and which were below 2%. Not surprisingly, over 9% of the Quebec-Labrador caribou in the book were taken in 1974; nearly 6.5% of the pronghorn in the book were taken in that same year, and almost 5% of the desert sheep were taken in 1974. At the other end of the spectrum are the brown bear and the bighorn sheep, with 1974 accounting for only 1.5% and barely 1% of the total entries, respectively.

Thus, if you take a book-quality head, you can anticipate about 3% of the total entries for that species will have been taken that year. The statistics also indicate the soundness of the minimum score figure for nearly all the species in the Boone and Crockett record book.

CURRENT CHANCES OF BAGGING #1 OF A SPECIES

If you hope this paragraph will give you some statistically precise estimate of your likelihood of bagging the top trophy in any one species at the present, you will be disappointed. But it *will* give you great encouragement that it's still possible to down *numero uno*. In fact, it is more than merely possible: During the last seven reported years, hunters bagged #1 and received gold medals for the following species: grizzly, black bear, mule deer and mountain caribou. Plus, we know a new #1 was taken in the last half of the 1970s for the Alaska-Yukon moose; in fact, three moose taken in 1978 and 1979 exceed the present #1. Incidentally, the previous #1 mountain caribou was taken in 1923; the new champ had to give away 26 points to that measurement of air rather than antler called "inside spread," and his rack still beat the 50-year reigning champion by nearly eight points.

A number of people also came in with runners-up trophies for these species in the 1970s: cougar, Columbia blacktail deer, whitetail deer, Quebec-Labrador caribou, grizzly, black bear and pronghorn. And, a couple of guys got bronze medals for Canada moose and desert sheep in the last seven years. Someone also got #4 among the Stone's sheep; that's impressive because no one expects anyone to eclipse the Chadwick ram. Additionally, #5 and #6 Stone's sheep also were taken during the last seven years.

Finally, one hunter bagged the fourth biggest elk of all time. That's particularly impressive when you remember #1 and #2 were taken in the 1890s. Just as important, however, is the fact that two other elk taken in the last seven reported years scored in the top 10. Imagine, three of the top 10 elk of all time were bagged in the last seven years; that may be the most refreshing statistic of all.

Some of the statistics are startling, aren't they? What they say to me as a trophy hunter is that "the big ones aren't all shot out"—in fact, the contrary is true. But they also seem to say something more important: Wildlife conservation efforts are paying off. To be fair, we should discount Quebec and its caribou as a new area, and the Baja somewhat similarly for desert sheep. But look at the number of recent super-trophies for grizzly and black bear; pronghorn; whitetail, blacktail and mule deer, and also the taking of three of the top six Stone's sheep and three of the top 10 elk. These species have always been hunted hard, but look at those reassuring results. The various game commissions, Safari Club International Conservation Fund and other rational conservation groups deserve a vote of thanks.

Sure, there are lies, damn lies and statistics. But these statistics put to rest the old, tired myth that trophy animals are a thing of the past. ■

Flowstone, found at the Lewis and Clark Caverns, sometimes looks like caramel corn (photo: Richard B. Aram).

Lewis and Clark Caverns:

A Showcase of Nature's Forces

text and drawings by Richard B. Aram

ALTHOUGH Lewis and Clark Caverns now feel dark and cool, the cave had its beginning in the bright, hot sunshine of a tropical sea. The cave is now deathly quiet, but the rocks once groaned with great earthquakes as the Rocky Mountains were born. Long before the thick coating of dust accumulated in the cave, water completely filled its passages.

The sea, the mountains and the water—powerful forces of nature—combined to create Lewis and Clark Caverns.

Long before Native Americans walked the Montana plains, and even before the Rocky Mountains first appeared, an ocean covered the western United States (Fig. 1). Sand and mud collected on the sea floor, and were petrified into sandstone and shale. These rocks record past visits by the ancient oceans.

Some 330 million years ago, the sea was unusually shallow, warm and clear, much like the Caribbean and Florida Keys today. This environment encouraged many organisms to grow, such as corals, algae, brachiopods and especially crinoids. Although the crinoids grew from roots and a plantlike stem (Fig. 2), they were true animals, related to starfish. Each crinoid head supported tentacles and a digestive system. However, only pieces of the crinoid stems are usually found as fossils because the heads were very fragile.

The salty sea water contained many dissolved minerals such as calcite (the same white mineral that builds up on faucets or inside kettles in your home). Animals removed this calcite from the sea water, and used it to grow their protective shells.

Millions of fossilized shells of these animals accumulated through time, and were petrified into a thick rock layer called the Madison Limestone. Rivers later carried sand and mud into the ocean, burying the Madison Limestone beneath thousands of feet of sandstone and shale.

Nearly all caves in the western United States occur in the Madison Limestone because it is made of calcite, and thus is more soluble than most other rocks.

The Rocky Mountains began to rise 80 million years ago, forcing the sea to retreat from western North America. The rocks in the mountains

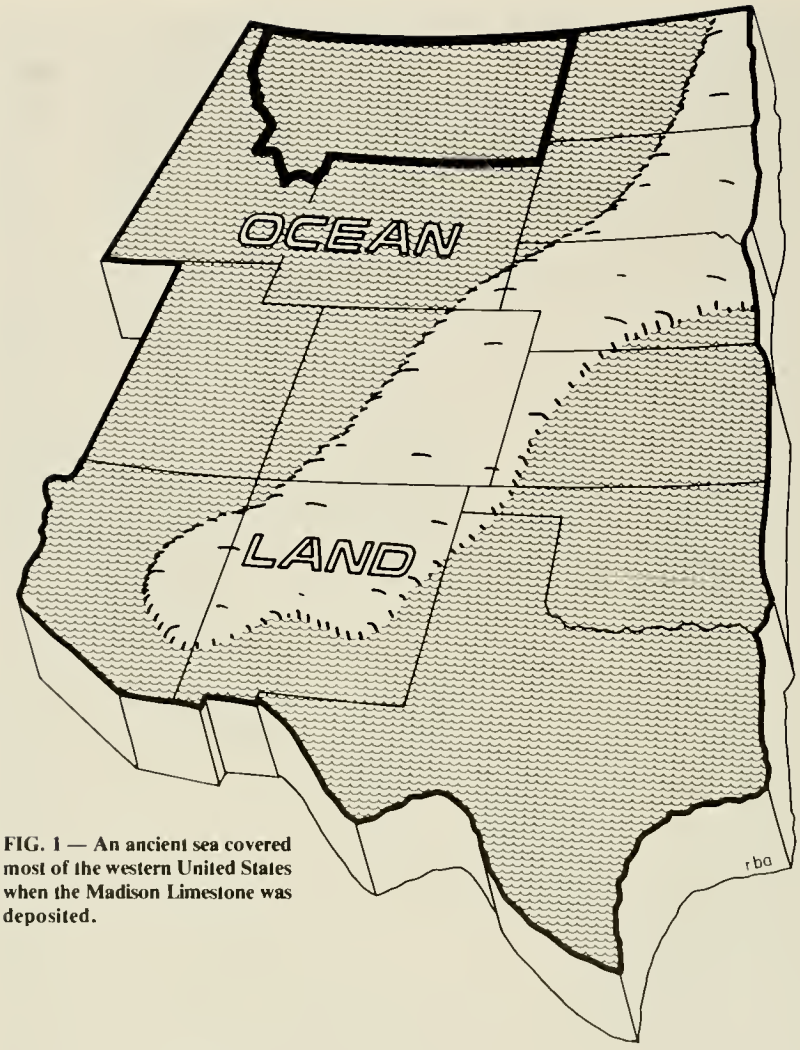


FIG. 1 — An ancient sea covered most of the western United States when the Madison Limestone was deposited.

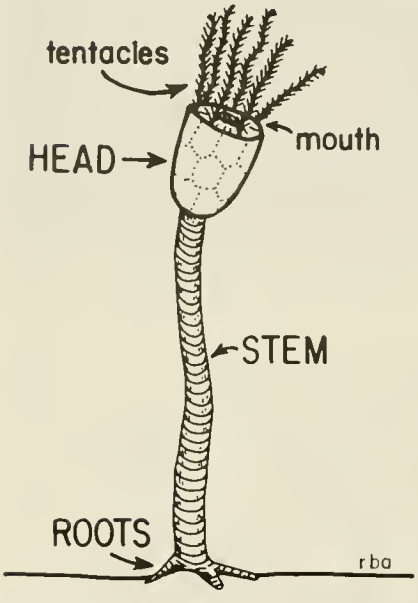


FIG. 2 — Warm, shallow seas encouraged organisms such as crinoids to flourish. Although crinoids grew from roots and a plant-like stem, they were animals, related to starfish. They often grew more than one foot high.

were pushed up and crumpled, so the Madison Limestone was bent and broken.

The mountains of Lewis and Clark Caverns State Park clearly record the actions of these tremendous forces. The rocks were first tilted nearly 60° from their original horizontal position (Fig. 3, A and B). The strata next bent into two adjacent folds, forming a large S-shaped pattern (Fig. 3C). Finally, the rocks shattered, and great blocks of rock slid several miles past each other (Fig. 3D).

These brutal events fractured the Madison Limestone at Cave Mountain and opened up millions of tiny cracks where acidic water later entered to excavate Lewis and Clark Caverns.

Rivers cut into the newly uplifted Rocky Mountains (Fig. 3E), exposing the rocks to the ravages of weather. The Madison Limestone suffered great damage because acidic waters dissolved away much of the rock. Rain water became a weak acid by picking up carbon dioxide from the air. Soil water was acidified from rotting plants and animals. These acids dissolved the Madison Limestone because the rock was made of calcite fossils from the former salty sea.

Rain and soil water entered the tiny pores and cracks in the limestone, slowly widening them into cave passages. The water followed the tilted rock layers, so most passages in Lewis and Clark Caverns are steep and narrow. These passages met at the hinge of one fold, forming the largest rooms of the cave. The water exited the cave at the hinge of the fold, where the rock was most fractured.

All of the cave passages we see today were completely filled with water when the cave was forming, less than two million years ago. The cave slowly drained as the nearby Jefferson River cut deeper into its canyon.

Water played the closing role in the creation of Lewis and Clark Caverns. Acidic water dissolved and removed large volumes of the Madison Limestone, enlarging the tiny cracks in the rock into large passages and rooms.

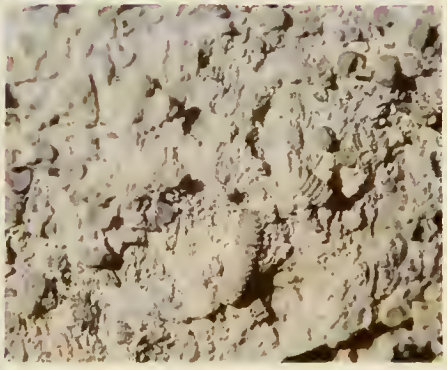
Today, Lewis and Clark Caverns are not growing any larger because they are no longer filled with water. Rather, the cave is shrinking as it slowly fills up with sediments.

When the cave first began to drain, the water could no longer help to hold up the ceiling of the cave, so the rocky roof began to collapse and huge boulders littered the floors of most rooms. The boulder rubble reached a thickness of nearly 300 feet in some areas. Fortunately, the collapse occurred long ago when the cave began to drain, and no boulders have fallen for thousands of years.

Old volcanic ash has also filled in parts of the caverns. An entire passageway was sealed off by more than four feet of ash, which was carried into the cave by a small stream. This ash is probably about 10,000 years old, coming from an earlier eruption of Mount St. Helens, Mount Rainier or another volcano in the Cascade Range.

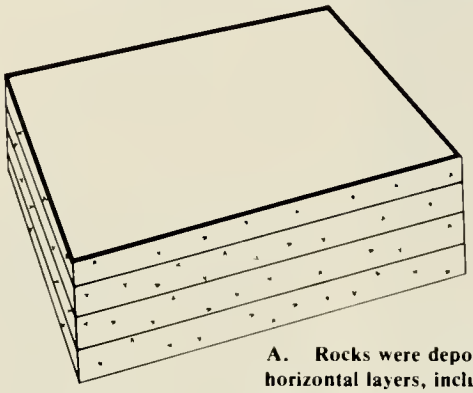
New deposits of calcite are currently filling Lewis and Clark Caverns with stalactites, columns and other forms collectively known as *speleothems*. Water deposits some of its dissolved calcite when it enters the

Stalagmites (left) grow larger and faster than other speleothems. Of the more than 200 caves in Montana, only three or so have any helictites (immediately below), but Lewis and Clark Caverns has millions. Hanging drops of water (below) create stalactites (photos: Richard B. Aram).

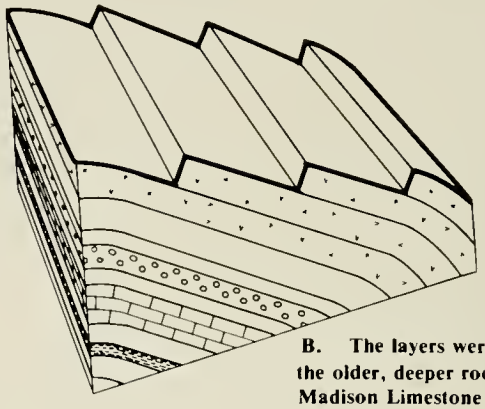


Montana was once covered by a tropical sea similar to the modern Caribbean (above photo: Nathan Aram). Chunks of fossilized crinoid stems (middle) make up much of the Madison Limestone. A spelunker (right) explores a portion of the collapsed Shining Mountains Room, where boulder rubble is over 300 feet thick in some areas (photos: Richard B. Aram).

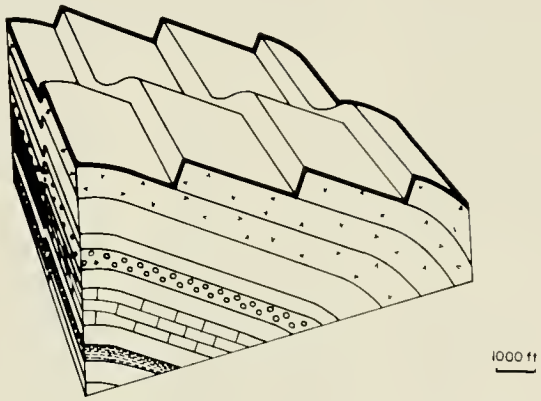
FIG. 3 — Evolution of the Cave Mountain Area



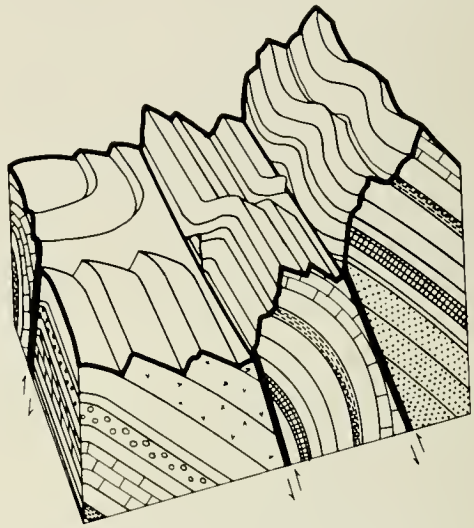
A. Rocks were deposited as horizontal layers, including a thick cap of volcanic lavas.



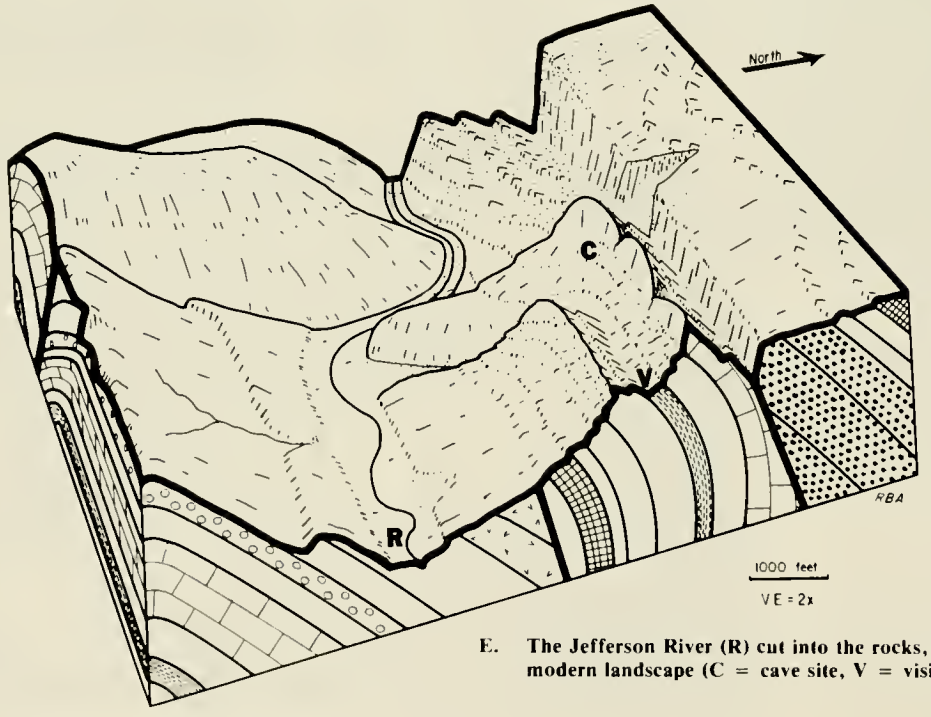
B. The layers were tilted, raising the older, deeper rocks such as the Madison Limestone (brick pattern).



C. The tilted layers were bent into an S-shaped fold.



D. Rocks were broken by three faults, pushing older rocks up against younger rocks.



E. The Jefferson River (R) cut into the rocks, creating the modern landscape (C = cave site, V = visitor center).

cave, because the cave atmosphere is less acidic than is outside air. Where water droplets hang on the ceiling, a small ring of calcite soon encircles the sides of the drop. The ring may grow downward, forming a stalactite shaped like a soda straw. If the water drips too fast, the calcite will be flushed from the ceiling. Calcite will then build up where the water strikes the floor, forming a stalagmite.

Flowing water creates speleothems shaped differently from those created by dripping water. Sheets of flowing water produce wavy sheets of stone, and ribbon-shaped rock builds up when the water flows along a narrow path.

Seeping water creates the most fascinating speleothems. The seepage may be so slow that the tiny crystals of calcite are free to grow in any direction. Helictites, grown from seeping water, curl in many directions, even upward against gravity.

Although the three acts of nature that created Lewis and Clark Caverns will not be repeated for thousands or millions of years, we can still experience some of their work. Millions of fossils in the Madison Limestone remain as traces of a great tropical sea that formerly blanketed the West. The tilted and broken rocks of Cave Mountain show us the power of the forces that built the Rocky Mountains. Water carved the walls of the cave long ago, and now decorates its own sculpture with beautiful speleothems.

Come and enjoy a showcase of nature's forces.■

Coyotes and Big Game *continued*

tion of the lows.

Eventually, the prey population escapes control by predators, either through decreases in predator numbers (primarily through reduced production and survival of young), or the predator switching to a more abundant food source. Thus, the stage is set for another prey increase when other conditions permit.

A number of predator-ungulate studies have concluded that either numbers or growth rates of ungulate populations were limited by predation, while many others have concluded just the opposite. Recently it has been noted that those cases suggesting control of ungulates by predators are essentially pristine situations where relationships between species are still intact. Investigations that came to the opposite conclusion dealt with situations where human disturbance had greatly altered either the food and cover of the ungulates, or the predator-prey population levels.

COYOTE CONTROL

Undeniably, the livestock industry must have protection from depredations on domestic animals. How this is to be accomplished and who foots the bill provide lively discussion, but this isn't the subject here.

Since coyotes utilize a wide variety of prey, many people conclude they have a negative impact on prey populations. This is especially true where game species may be included as prey. Many sincere individuals view coyotes (or other predators) as the sole obstacle to an almost unlimited abundance of game animals.

It has been frequently pointed out that changes in the number of coyotes in an area are more complex than simple responses to intensity of control, and many studies have found that coyote populations fluctuate (often quite widely) independent of control activities, apparently in response to changing abundance and availability of prey.

The examples of coyote reproductive potential and natural mortality given earlier show the magnitude of the effort necessary for man to significantly reduce a coyote population, and also the rapidity with which numbers can rebound when freed from intensive control efforts. At least to a certain point, human-caused coyote mortality simply replaces natural mortality (the compensation mentioned earlier). Only when this point is surpassed can man-caused coyote mortality cut into the population. However, if this level of control is attained, remaining coyotes become better fed, probably survive better, and almost certainly reproduce at a higher rate.

Recently, several researchers have used computers to model coyote populations under varying levels of control and using the type of data we did in the example above. One study found that a population could withstand an annual *control* kill of 70% but not 75% of the post-whelping population. Even at the 75% control level, it would take 50 years to eliminate the population.

This model did not consider dispersal, which can have considerable effect by repopulating a heavily controlled area from surrounding areas of lighter control. Even discounting dispersal, coyote populations can recover from severe reduction quite rapidly. The computer model showed that a breeding population reduced to only *9%* of its pre-control level fully recovered in five years without control. Since some immigration would occur, recovery would probably be faster.

CONCLUSIONS

Despite the capacity of coyotes to increase rapidly, their numbers were highest at the start of the study and appeared to decline and increase again on most areas during the course of it. Missouri Breaks areas represent the best example, since no formal coyote control was carried out and the best coyote population data were available there. Fluctuations in coyote numbers appeared to be related to food supply, especially the increase in 1978 and 1979 which coincided with an upsurge of small mammals.

What did we learn from the six-year study? At present and with existing conditions, coyote control solely to benefit big game in Montana can be neither justified nor recommended. To benefit wildlife, coyote control would have to extend only to *local* situations where (and in the few years when) it could potentially increase the game available to hunters. The economics of control efforts vs. produced benefits must be the major consideration—the hunter's money should be spent where it most benefits the hunter. This does not mean the situation can't change in the future.

Some people will say that we reached a conclusion to fit our preconceived bias, and many of these critics could not be convinced of anything else. Yet when you boil it all down and consider the costs involved, to really impact coyote numbers and the resulting benefits of big game produced, there can really be no other conclusion.■

WILDFIRES:
Not Always Disasters
by Larry C. Eichhorn and C. R. Watts

ALTHOUGH Native Americans and early settlers realized the values of fire in creating habitat for animals they favored, for many years wildfires were viewed as a sort of 20th century version of the plague. Like plagues, fires often devastated otherwise tranquil environments. More recently, however, scientists have discovered the importance of fire not only for animals, but also for a variety of plant species.

Wildfires have swept through forests and rangelands for millions of years, influencing the evolution of both plants and animals. Fire creates a diversity of vegetation types, each with its own dependent wildlife. The endangered Kirtland's warbler, for example, requires eight- to 20-year-old jack pine stands for nesting in its Michigan habitat. In the absence of fire, jack pine stands mature, eventually becoming unsuitable for the warbler. On the other hand, periodic fires melt the resin sealing the cones of jack pine, allowing seedfall and regeneration of young stands.

Land management agencies now recognize the value of fire as a tool for creating habitat for wildlife and livestock. These agencies develop fire management plans that take into account the negative aspects of fire, such as charred scenery and potential damage to fragile watersheds, while also noting the positive effects of fire on natural ecosystems.

The U.S. Bureau of Land Management and the U.S. Fish and Wildlife Service are developing fire management plans of this sort in the Missouri River Breaks. This area, which comprises about 1.5 million acres in north central Montana, is characterized by closely interspersed ridges and sharply cut coulees. Vegetation in the Breaks is a mosaic of many types, depending largely on topography, soils and time since the last fire. Historically, fire largely determined the vegetative composition of the area, periodically burning through the ponderosa pine, Douglas-fir and Rocky Mountain juniper. One important aspect of fire management for this area is to allow fire to function naturally, yet safeguard property and important resources.

About 15-20 fires occur in this region annually. Rarely larger than one square mile, the fires burn with various degrees of intensity, leaving many islands of unburned vegetation. This characteristic burn pattern provides a variety of vegetation types. Revegetation on late summer or early fall burns is usually quite rapid and, with the advent of fall precipitation, there is often a fall green-up. By the following summer, vegetative cover protects most of the ground in these areas (see photos).

Even on intensively burned sites (usually north slopes, which support a closed canopy of coniferous cover), vegetation responses are rapid. In fact, forb and shrub cover on burned north-slope areas exceeds that on unburned areas in two years, and grass cover equals that on unburned areas in three years. Other sites respond even more rapidly.

A

1970

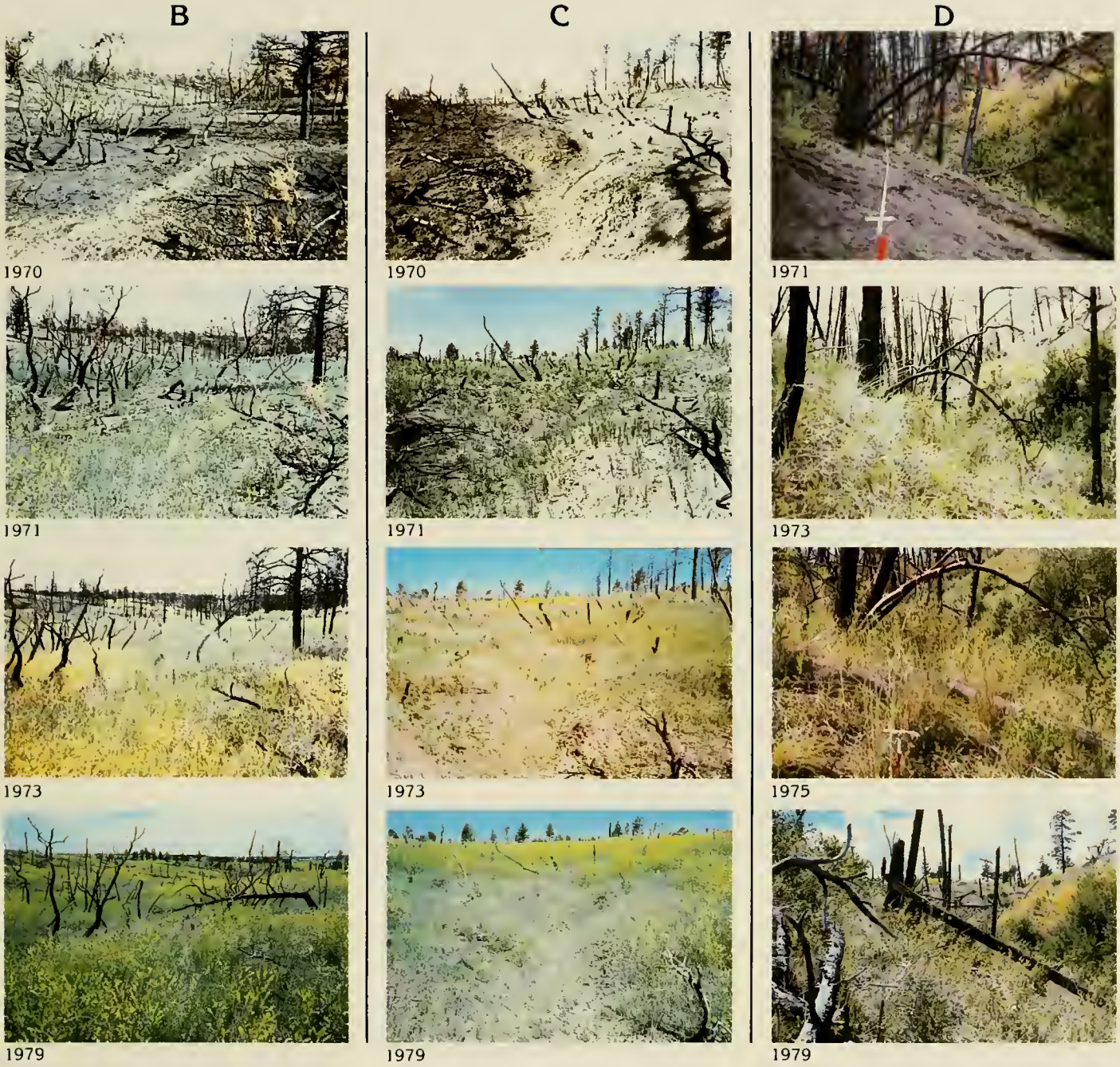
1971

1973

1979

As evident from the photos, there is a short period after a wildfire when the site is less desirable to grazing animals. However, the varying intensity of the fire plus the islands left unburned leave the area as suitable habitat for even resident grazing species.

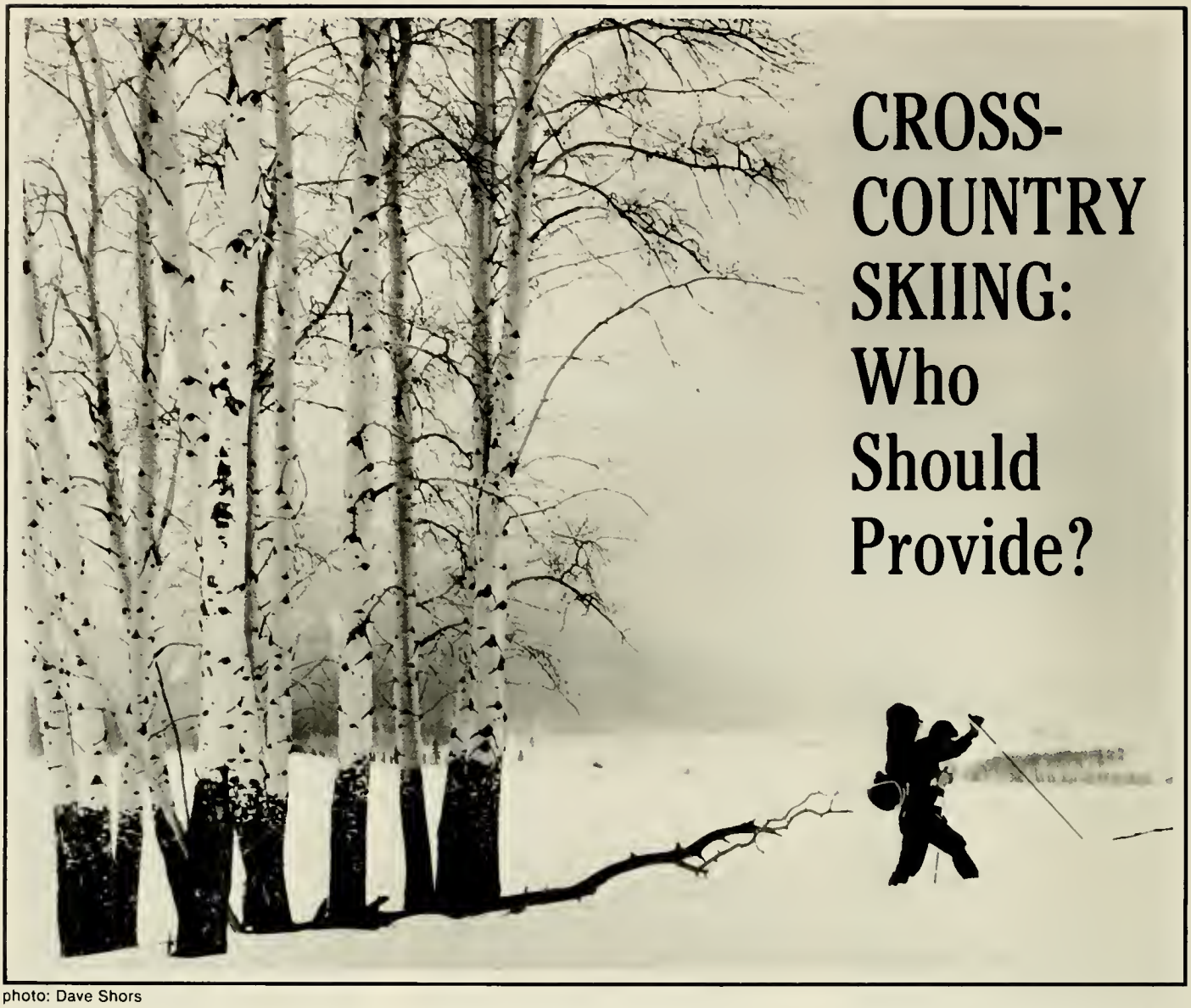
The benefits of wildfire in the Missouri River Breaks are similar to those documented for other areas. The initial grass-forb stage is highly



attractive to grazing animals, while the dead trees attract hole-nesting birds such as mountain bluebirds, wrens and several species of woodpeckers. These early successional stages created by fire provide habitat for sharp-tailed grouse and many small birds that require a ground cover of vegetation. The burns remain attractive to livestock and elk as the grass cover thickens. Mule deer show a decided preference for the burns as shrubs such as chokecherry, rabbitbrush, wild rose, skunkbrush and snowberry establish themselves in these areas.

Research on the effects of fire continues, but one thing already seems clear: Burns provide a changing succession of plants—a succession essential to maintaining bird and animal diversity. Thus, wildfires are not always disasters; sometimes they are the prelude to progress. ■

All sites represent vegetation recovery following an Aug. 13, 1970 wildfire in the Missouri River Breaks. The group of four pictures in Column A shows a big sagebrush ridge top; Column B, a scattered ponderosa pine-Rocky Mountain juniper southeast slope; Column C, a Rocky Mountain juniper draw, and Column D (the most intensively burned area), the north slope conifer sites (photos: Larry C. Eichhorn).



CROSS-COUNTRY SKIING: Who Should Provide?

photo: Dave Shors

by Terry Knupp

IF YOU ARE a long-time cross-country skier, you have seen your sport grow from a handful of dedicated people to a burgeoning army of long-board enthusiasts of all ages. At present, there are an estimated 112,000 cross-country skiers in Montana. Some of these people are new to the sport of skiing, and others are defectors from the alpine slopes. In the old days, you may have skied only the backcountry—following logging roads and hiking trails, or blazing your own trail. In recent years, you may have followed trails developed specifically for cross-country skiing, and some of these may have had set tracks.

These expanded opportunities are not only the result of skiers demanding different experiences, but are also influenced by those who provide the opportunities, such as private groups and resource management agencies. What will you as a cross-country skier need in the 1980s, and how will the "providers" respond?

WHAT SHOULD BE PROVIDED?

In June 1980, a group of cross-country skiers met in Helena at a workshop sponsored by the Department of Fish, Wildlife and Parks. Workshop participants compiled a list of needs of their sport in Montana. These could be roughly classified under the following categories:

1. **Parking access**—the need to plow snow out of key parking areas and to develop some additional parking areas.
2. **Trails**—the need to develop and maintain more cross-country ski trails (clearing, marking, signing and, in some cases, grooming).
3. **Safety**—the need for skier safety training and for winter rescue training and equipment.
4. **Information**—the need for published guides to ski trails and for technical assistance from government agencies.
5. **Coordination**—the need to coordinate efforts of agencies, clubs and private interests to provide cross-country ski services.

In addition to identifying these needs, the people at the workshop considered *who* could help. Public agencies such as the U.S. Forest Service, the Montana Department of

Highways and the Montana Department of Fish, Wildlife and Parks were discussed, along with private business, in terms of their ability to provide services.

The group also briefly considered funding sources to pay for the help received. These included:

1. **Voluntary ski permits**—a nonmandatory skier license similar to a fishing license.
2. **Snow-park permits**—a mandatory decal required on an automobile parked in a marked (and plowed) area.
3. **Equipment taxes**—a sales tax on ski equipment similar to the tax on hunting and fishing equipment.
4. **Daily use fees**—a daily charge at certain sites developed and maintained with the revenues.
5. **Grants**—a grant from various sources to develop cross-country ski facilities or services.

The skiers at the workshop did not conclude that any one of these sources would be able to meet all the needs of the state's cross-country skiers, but it seemed that each might be used in specific cases. They did agree that needs and funding sources should be examined further.

WHO'S RESPONSIBLE?

Private enterprise will continue to expand and meet many cross-country ski needs in Montana during the next decade. It will become more common for cross-country skiers to pay a user fee for services like groomed trails and off-highway parking. Some private ski businesses will be the most cost-efficient means of meeting skier demands. For example, a ski-touring center will only survive if it delivers satisfactory services at a cost acceptable to the user.

The ability of public agencies to meet cross-country ski needs will be tested in the '80s. Although many were able to provide services during the last decade, they may not be able to increase or, in some cases, continue these services during the next decade because of limited money or lack of legal authority to use that money for cross-country ski services. For example, most local recreation agencies have no financial resources to operate cross-country ski facilities or programs in their communities. However, at the June 1980 workshop, skiers gave top priority to the need for more groomed and marked trails near population centers.

Federal agencies (such as the U.S. Forest Service, the National Park Service and the Bureau of Land Management) will probably continue to serve cross-country skiers. But it will become increasingly difficult in the face of rising inflation and cutbacks in federal budgets. These agencies may have to reduce services or rely on additional volunteer efforts, cooperative agreements and private concessions. Some needs identified at last June's workshop addressed cooperation between cross-country skiers and federal land management agencies. Skiers felt they needed a better understanding of how various federal agencies operate and stressed the importance of uniformity among the various agencies in providing cross-country skiing opportunities.

If you have more specific concerns about cross-country skiing in your area—such as having a particular trail marked—contact the following sources. They may be able to help, or direct you to someone else who can: (1) U.S. Forest Service—contact the district ranger within the local national forest district. The listing in the telephone directory will be under U.S. Government; Agriculture, Department of; Forest Service. (2) Montana Department of Fish, Wildlife and Parks—Parks Division (complete address appears at the end of this article). (3) Other possible sources include local park and recreation agencies or local ski clubs.

HOW COULD A RECREATION TRAILS GRANT HELP?

Cross-country skiers at the June 1980 workshop requested that the Department of Fish, Wildlife and Parks further explore funding sources to meet the needs identified. In response to this request, the department applied for a grant from the state Renewable Resources Development Program. The application asked for $46,500 to fund a "trails coordinator" position for 1982 and 1983. Through the trails coordinator, various funding sources (federal, state, local and private) could be coordinated and directed to specific projects. The proposed coordinator would operate within the department's Parks Division. In addition to cross-country skiing, trail needs for bicyclers, joggers, horseback riders, pleasure walkers and others would be addressed.

Primary duties of the coordinator would be to:

- Help local communities develop recreation/transportation trails.
- Help user groups (as requested) find solutions to their trail need problems.
- Develop regional information guides to recreation trails.
- Prepare a short course for trail safety, conservation and etiquette.
- Complete an inventory of trails with user-access problems.

The "trails coordinator grant" must be approved by the 1981 Montana Legislature. It has been evaluated by the Department of Natural Resources and Conservation, which recommended to the governor that it be funded. The governor may submit these recommendations to the Legislature in the form of a proposed law. The Department of Fish, Wildlife and Parks will support the trails coordinator proposal at legislative hearings during the 1981 session. However, the Legislature will be interested in evidence of public support. If the bill passes both houses and is signed by the governor, the "trails coordinator" grant funds will be appropriated for a two-year period.

WHAT CAN CROSS-COUNTRY SKIERS DO NOW?

The Department of Fish, Wildlife and Parks is currently working on a Statewide Comprehensive Outdoor Recreation Plan (SCORP) scheduled for publication in May 1983. SCORP '83 will address needs, make recommendations to managing agencies and set policy concerning the state's recreation resources. SCORP planning will also make the state eligible for 50/50 matching federal funds for state and local recreation projects.

If you are a cross-country skier, you can assist in the development of statewide goals and objectives for cross-country skiing by sending your written comments and recommendations to SCORP '83, Parks Division, Montana Department of Fish, Wildlife and Parks, 1420 E. Sixth Ave.; Helena, MT 59601. Through the cooperation of everyone involved, cross-country skiing in Montana can grow stronger in the coming decade. ■

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